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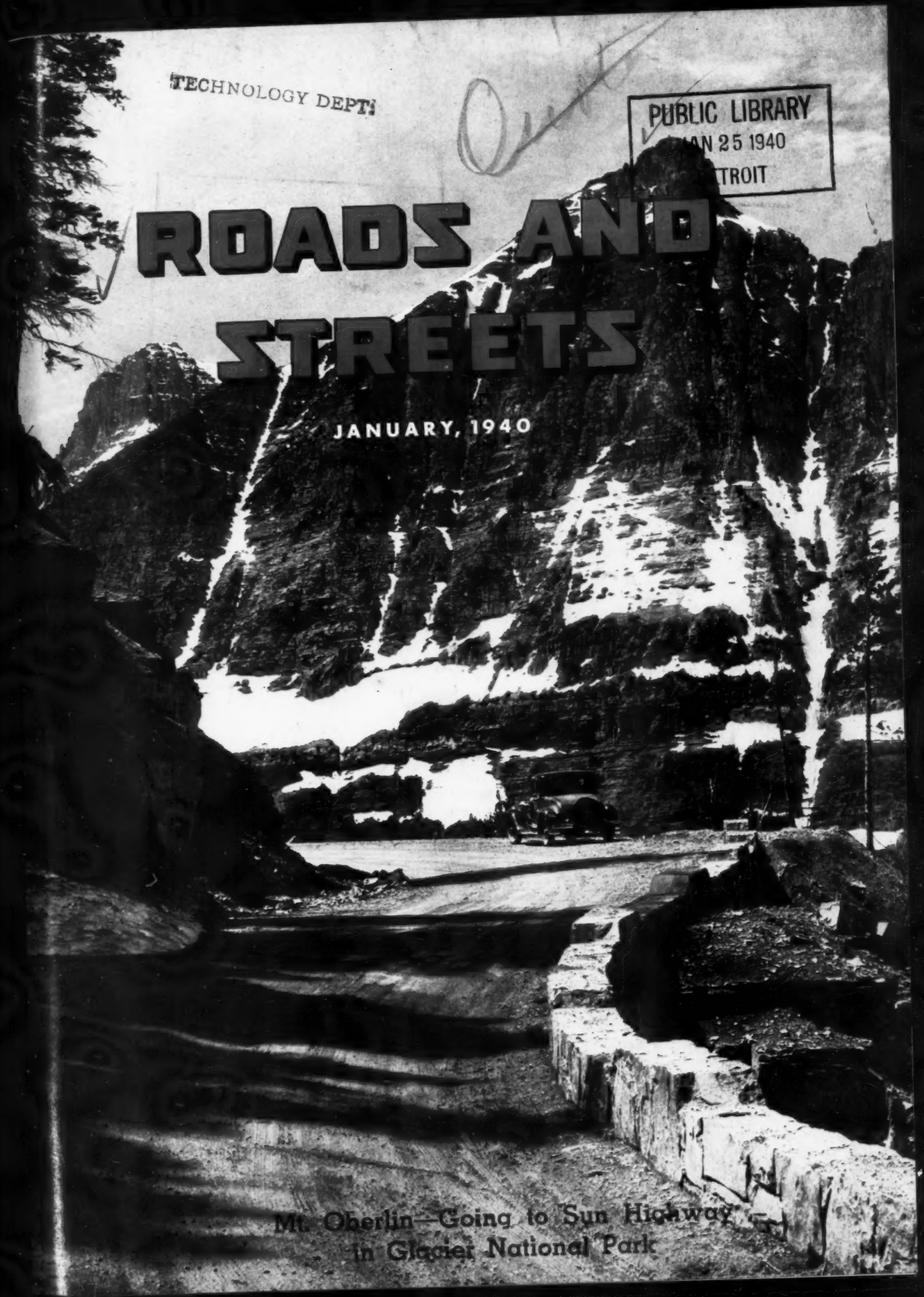

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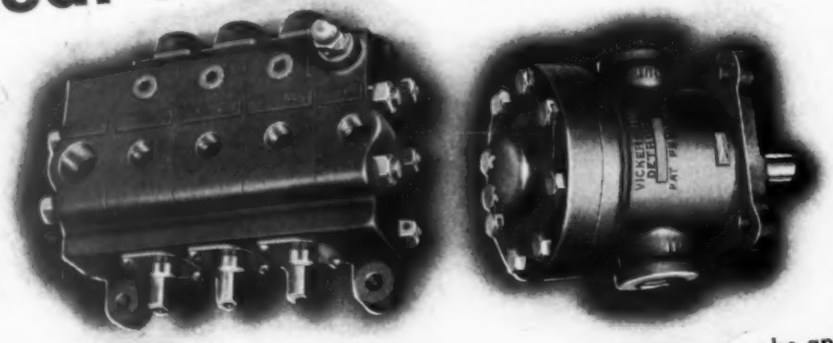

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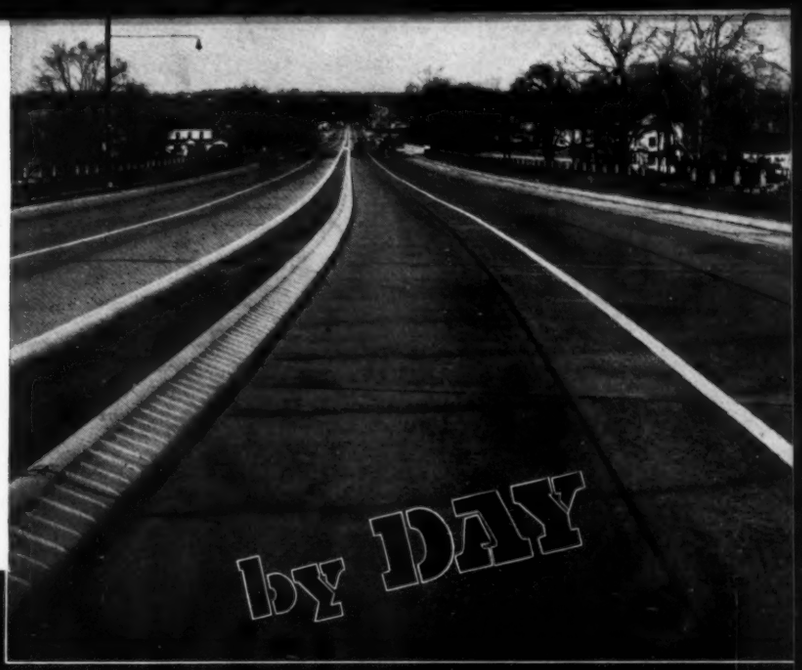

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Vol. 83, No. 1 January, 1940

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Indiana Looks Into The Future. Route U. S. 30, Near Hammond, Has Engineered Safety Built-In.

INTERREGIONAL HIGHWAYS

America's Highways—New Frontiers In National Progress

By PAUL G. HOFFMAN

President, The Studebaker Corporation, and Chairman of the Highways Committee of the Automobile Manufacturers Association

IF THE gentleman who tells you that our national frontiers all have disappeared would take the trouble to look out of his office window, he might make a shocking but enlightening discovery.

He would see, of course, only a street. But perhaps he would recognize this street as a part of the 3,000,000-mile highway system which last year carried 90 per cent of all the passenger mileage in the United States.

Then you could remind him that motor vehicles traveled about 260 billions of miles on this highway system in 1939—enough miles to take his family car around the earth at the equator ten times every day from now until the year 4789, which is nearly 3,000 years hence.

Let him absorb this slowly, for it is sometimes positively staggering for someone who hasn't thought about it to realize suddenly what a tremendous impact has been registered on our national life during the last three decades as a result of the motor vehicle and the highway. In this brief span, both rural and urban social patterns have been profoundly changed, and a great industry has arisen which now supports, directly or indirectly, one-seventh of all the wage earners in the nation, and provides huge markets for the products of all the others.

And now it is time to give this gentleman a real jolt. Tell him all this is but the beginning, and that the big development in highway transport still lies ahead. The astronomical 260 billions of miles in 1939 will become a fantastic 500 billions in 1950, if adequate roads and streets are provided to handle it safely. More vehicles will be built, more purchasing power and markets contributed to the national economy.

Incredible? No, incontrovertible. Careful estimates of the Public Roads Administration (formerly the Bureau of Public Roads), based upon the wealth of facts accumulated in the $10,000,000 survey in which the highway departments of 46 states and the District of Columbia cooperated, show it to be true. Highway usage, given a chance, can double within two decades.

New National Frontier

In highways, then, lies a new national frontier for the pessimist who thinks frontiers have disappeared. It runs right by his very doorstep. It challenges the imagination and the spirit of enterprise which always have been the distinctive marks of American life. And even the gloomiest of men admit that America never ignores the challenge of a new frontier, geographical or otherwise.

Yet like every other worthwhile opportunity, the expansion of the highway system offers serious problems. The biggest job unquestionably will be to provide streets and highways adequate for the demands anticipated.

The federal report citing the potentialities of the future also points out some of the things which must be done if these frontiers are to be conquered. Already the requirements of traffic exceed the facilities. Arterial streets in large cities, where travel is concentrated, are mostly bottlenecks, choking traffic at its heaviest points. Congestion is hazardous and expensive.

Direct interregional highways are needed to link populous areas, and to eliminate the sharp curves and grades, the multiple crossings and the restricted roadway widths which now hamper the flow of traffic over long distances. The surveys show that approximately 11,000 miles of our present rural highways were built prior to 1921.

The interregional routes, constituting the primary

highway system of the land, would represent less than 1 per cent of the total road mileage—a system totaling 27,000 miles has been tentatively drafted—but would handle eventually one-eighth of the entire national traffic load.

Orderly development of secondary roads, in accordance with traffic demands and land utilization values, also is necessary.

Many obstacles block the way to these improvements. Acquisition of land for right-of-way, for example, is sometimes an exceedingly difficult task, especially in and near large cities, where improvements are revealed by the surveys to be desperately urgent. Legal procedures affecting rights-of-way, many of them pre-dating the automobile, have to be brought up to date, in order to avoid costly delays and still worse congestion of traffic. Capital financing of projects in many cities and states must somehow be arranged.

These are the things yet to do. They are big jobs, and require the understanding and support of citizens and the hard work of public officials everywhere.

But things already done are impressive, too, and give solid basis for the prediction, which I make here and now, that legislative and financial obstacles to highway expansion can be—and will be—speedily overcome.

Our present highway system is one reason for encouragement. Deficient though it is, measured by existing needs, nevertheless it is the greatest highway transport system ever constructed, and a tribute to America's engineering genius. Considering the handicaps under which it was built—the financial limitations, the pressure of time, the lack of precedents or national planning, and, above all, the breath-taking increase of highway usage beyond the wildest dreams of 1910—the existing road and street system stands out as a remarkable achievement.

The master plan for the nation, providing a uniform pattern of progress in which all cities and states can share, with assurance that they will be providing for themselves the facilities actually most necessary now and which will be increasingly needed in the years ahead.

The significance of the master plan, and its underlying surveys, can not be over-emphasized in any appraisal of the highway problem. It rests upon hard facts, the essential foundation for every intelligent program; facts showing exactly what the traffic is, where it is going, and what facilities are needed to take it there, safely and efficiently.

As a comprehensive national program, it substitutes for guesswork; it eliminates the cross purposes and confusion which grow out of uncoordinated planning by the individual cities and states; it establishes a blueprint for assisting the national defense through increased mobility of men and supplies, and in general it puts the highway movement on a unified and orderly basis.

Finally, there is the financial side, at once a problem and a source of encouragement. In 1939, motor vehicle users paid $1,631,000,000 in local, state and federal taxes, which was 11 per cent of all the taxes collected in the country during the year. Of this sum, $1,035,000,000 was collected in taxes on gasoline.

If the 30,710,000 motor vehicles now registered in the United States should continue to contribute this amount in taxes, year after year, and if diversion to non-highway purposes were completely eliminated, the funds to be made available for highway purposes during the next two decades would total $32,620,000,000.

But highway usage will not remain static. With better and safer highways, an increase is certain. According to the best estimates, approximately 40,000,000 motor vehicles will be in service by 1960, with the total mileage, as already observed, probably 500 billion miles, or nearly twice that of 1939.

Highway revenue thus can be expected to total approximately $50,000,000,000 during the ensuing decades, assuming, of course, that the existing tax rates will remain unchanged.

Now 50 billions of dollars, even in these days, is a large sum of money. Over a period of 20 years or so, if properly used, it ought to finance the interregional highways, most of the urban and suburban superhighway construction, including debt service on capital outlay for right-of-way acquisition, and provide substantial modernization of our secondary roads as well.

Certainly, it is a big enough sum to warrant the adoption of an intelligent program for its expenditure!

It is not unreasonable to foresee, with increased highway usage and highway revenues, that the annual expenditure will be stepped up by at least half a billion dollars during these years. In terms of economic frontiers, such an increase offers something to think about. Half a billion dollars is more money than was paid last year at wholesale price for the products of the entire paint and varnish industry. It would buy from the factories in any year all the ice cream and all the drugs and medicines manufactured. Its expenditure annually in a new enterprise would be proclaimed joyously on all sides; but it is no less important to the national economy when paid out for wages and materials to build the modern highways so acutely needed.

And highway expenditures tell only a part of the story, because millions of persons in allied industries also share in the benefits of the motor transport industry. The Automobile Manufacturers' Association has estimated that 6,380,000 persons—one-seventh of all who work for pay—are employed directly or indirectly in the highway transport field. Their combined earnings total more than seven billions of dollars a year, a huge segment of the country's purchasing power.

Increased motor vehicle mileage is reflected directly in the business—and employment—of many industries. Trucks and automobiles, for example, consumed 90 per cent of the gasoline produced last year, 80 per cent of the rubber, 33 per cent of the lead, 16 per cent of the steel, and were the largest purchasers of lubricating oil, plate glass and other products.

Thus the economic opportunities of the new national frontier, highways, are plainly evident. Not so apparent but more vital by far are the social aspects of America's great personal transportation system.

New horizons are constantly being created with the expanding use of the automobile and the truck, diffusing cultural advantages, enlarging opportunities for travel and recreation, for decentralization of cities, for weaving the fabric of social unity in a vast nation by destroying distances between its people.

As the number of motor vehicles increases—and the mileage of travel multiplies still faster—farm houses are drawn closer to school and church and city, while urban dwellers are moved minutes instead of days from the countryside. The car taking a doctor to a home once remote, or the worker through the countryside to his factory in the city—these are the symbols of significance for highway transport.

That the roads, therefore, shall be adapted in adequate measure to the social needs of the nation, in efficiency and in safety, is the ultimate challenge of the new national frontier—America's highways.

The Henry Hudson Parkway Continues the West Side Highway in New York City Northward to a Junction with the Westchester County Parkway System and with These Connections Provides a Continuous Express Highway Through the Nation's Greatest Metropolis. In This View the Parkway Is at the Left. The Road at the Right Is One of the Local Service Roads.

INTERREGIONAL HIGHWAYS

Indicated by State-Wide Highway Planning Surveys

By H. S. FAIRBANK

Chief, Division of Information, Public Roads Administration, Federal Works Agency

IN ITS report on "Toll Roads and Free Roads," which President Roosevelt sent to Congress with an approving message last spring, the Public Roads Administration advanced a number of recommendations describing the broad outlines of a master plan for free highway development in the United States. As one of the important elements of the plan, but not by any means the whole plan or even its most essential part, the Administration proposed the designation and construction of an interregional highway system to interlace the various sections of the country with a network of direct routes, of an aggregate length not exceeding one percent of the Nation's total road mileage, which would be about 30,000 miles.

In the same document the Administration reported adversely upon the feasibility of financing a designated 14,000-mile system of trans-continental highways with direct tolls, estimating that the tolls collectible would recover less than half the cost of such a system as a whole in the period prior to 1960, beyond which no estimate was attempted.

Some readers of the report have been troubled by a seeming inconsistency of the toll road finding with the recommended construction of a Nation-wide interregional system more than twice as large, as a free facility. "If," they say, "the tolls collectible from the maximum traffic that can be expected on the 14,000-mile system fall so far short of paying the cost of that system, how can the expenditure of tax revenue be justified for a so-called free system more than twice as large? The money to build the system will have to be raised somehow. If the road users won't pay it, who will?"

Actually, there is no inconsistency between the toll road finding and the interregional road recommendation. The deficiency of traffic for self-liquidation on the toll system would be due mainly to the inability of that system to attract usage against the competition of reasonably satisfactory "free" highways and to the impracticability of its use by a large fraction of normal highway traffic, the trip lengths of which are shorter than the essential distance between entrances to the toll roads. The construction cost of the interregional system, on the other hand, can be kept within the limits of road-user tax revenues generated by traffic on the system. Of this fact there is assurance in the information amassed by highway planning surveys in 46 states; but the clarification of superficial doubts is not assisted by such discussions as those which have recently appeared on the editorial pages of the magazine "Railway Age" and their stereotype reproductions in a section of the daily press.

In these discussions the Administration's reasonable proposal is made to appear in fantastic guise by a ten-time magnification of the probable cost. The misinformed editors assume the 20-year cost of a 28,000-mile interregional system to be between 35 and 40 billion dollars. By adding just a few more billions their upper figure could properly be assumed as the probable cost of the Nation's entire street and highway system during the 20-year period. As an estimate of the cost of the proposed interregional system only, the estimate needs to be scaled to about one-tenth of the stated amount.

The Administration's estimates of the traffic that would use the 14,000-mile toll road system placed the probable vehicle-mileage at approximately 1.2 per cent of the

total usage of all rural roads. For an interregional "free" system less than twice as large its estimate of probable traffic was more than ten times as great. In this difference between the estimates of prospective traffic for the two systems lies a good part of the explanation of the difference between them from the standpoint of financial feasibility. Partly also the explanation is found in the higher per-mile costs of both construction and operation for the toll road system.

Balanced Traffic Needs Essential

As previously stated, the interregional system alone is not regarded as a sufficient answer to the present needs of highway transportation. Its construction would be only one part of a program of systematic highway modernization, the urgent need of which is shown by the highway planning surveys. On the existing Federal-aid and state highways there is much to be done in the easing of sharp curvature; the reduction of steep gradients; the lengthening of short sight-distances; the widening of pavements, surfaces, and shoulders; the elimination of railroad crossings; and the construction of stronger and more durable bridges with ampler horizontal and vertical clearances. In and near cities and towns there are needed arterial streets, bypasses and belt lines that are not included in the rather restricted interregional system that has been proposed. Then, too, there is still an important job to be done to effect a really systematic improvement of secondary and feeder roads, properly integrated with the primary system, and extended to the economically feasible limit, in order to bring the benefits of improved road service as closely as possible to the homes of the rural population.

In the great mass of factual data which the planning surveys have collected there is evidence of the need of all these classes of improvement, and there is also information necessary for their adequate planning in detail. The place and kind of each needed improvement can be determined. The traffic that will benefit by each can be estimated. The probable costs of each can be computed within reasonably approximate limits, and there can thus be integrated for each city, each county, each state and for the country as a whole, a schedule of the additional street and highway improvements needed to correct, in the next 20 years, the obvious deficiencies and inconsistencies of pioneer improvements effected in the last 20 years.

If in the next score of years we are actually to produce a highway system improved in its various parts in essential balance with the respective traffic needs; if we are to do so efficiently, and without danger of excessive and insupportable total and continuing cost, then it is high time that we set about such a scheduling of the improving operations. We can hold these operations in total within any desirable limits of cost. The total revenues to be taken from the pocketbooks of taxpayers can be kept within any agreed maximum limits. The tax collection can be continued at the present rates, if that is desired, and a correction of the presently inconsistent improvement of the highway system can in time be effected. But such a result cannot be attained unless the available revenues, whatever they may be, are allotted to the various parts of the whole street and highway system in strict proportion to the determined improvement needs of the several parts; and this, therefore, should be a first objective of future highway planning.

What this means is that we have passed the time when the planning of improvements of the primary rural high-

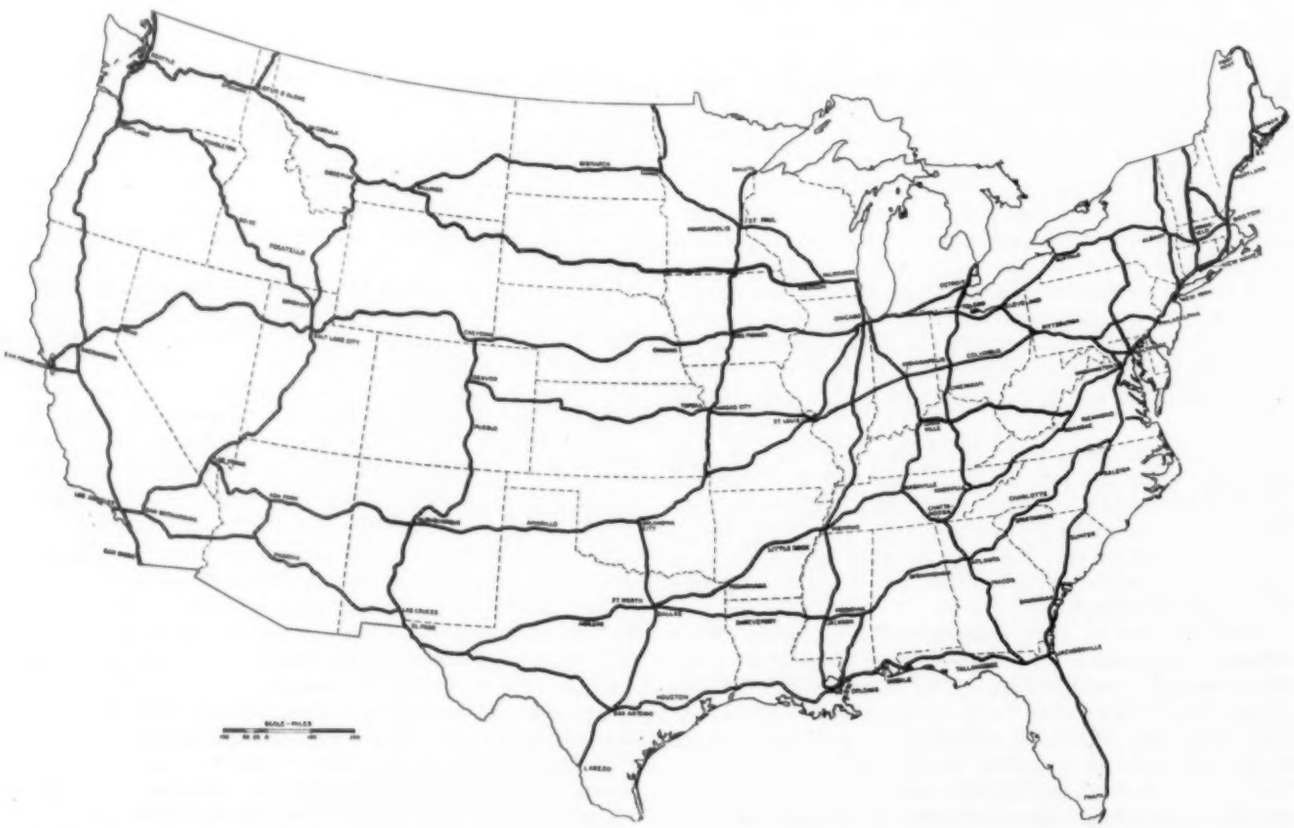


Fig. 1—The Interregional Highway System as Now Tentatively Selected by the Public Roads Administration in Co-operation With the State Highway Departments. The 29,315 Miles Included Is Slightly Less Than 1 Per Cent of the Country's Total Rural Road Mileage.

ways could reasonably be considered apart from the improvement of the feeder roads of the rural system, and both of these without regard to the needs and plans for city streets. We have passed the time when each year's construction program on streets or highways could reasonably be prepared without conscious relation to the ultimate objectives of a general long-time plan. For the development of each section of the whole street and highway system there would be a definite prevision of the condition to be achieved within a period of 10 or 20 years; and over these several partial plans, to maintain a consistent and reasonable relation between them there is need of a master plan. It is such a master plan that is suggested in broadest outline in the report of the Public Roads Administration on "Toll Roads and Free Roads," and it is as a part of such a master plan that the proposed construction of interregional highways should be considered.

Suggested Interregional Routes

In its report to Congress the Administration presented a map of a 26,700-mile system, which it had tentatively designated after consultation with the War Department and all state highway departments. That system, after further study, has been slightly revised and extended to form the system indicated in Figure 1, which includes approximately 29,315 miles.

The need for the designation of this system or some reasonable modification of it is the present need for adequate arterial highways directly connecting the principal cities of the country. The existing main highways, in most instances, do not provide such connections. Resulting from the joining of improvements extended outward from adjacent towns, their course between the larger cities is often quite circuitous; and, superimposed upon such major deviations, their alignment suffers from the complacency with which local indirection was accepted in the earlier pioneer period of road improvement, in order to avoid the costs and delays of acquiring the new rights-of-way, and overcoming the physical obstacles necessary for the projection of straighter courses.

It is not the transcontinental traffic that demands the provision of such a system. If there is one fact that the planning surveys have demonstrated more clearly than another it is the fact that traffic of transcontinental range is now, and always will be a very small part of the total of all traffic in any highway. The traffic which the proposed system is designed to serve is that important traffic that now is moving daily from one large city to another, and from one general region of the country to another. Generally the trip lengths of this traffic are measured in the hundreds rather than in the thousands of miles; but it is nevertheless a traffic that is quite distinct in its characteristics and demands from the local traffic that forms the bulk of the total on most of the existing primary highways. It is a traffic that moves by day-long stages, and pressing each day toward an evening objective it moves at a rate that is invariably well above the speed of the local traffic with which it is intermixed on the existing roads. It is a traffic that is impatient of the delays imposed by the necessity of frequent passage through small towns on the present highways, and reluctantly reduces its open road speed to the lower limits which considerations of safety suggest as essential for

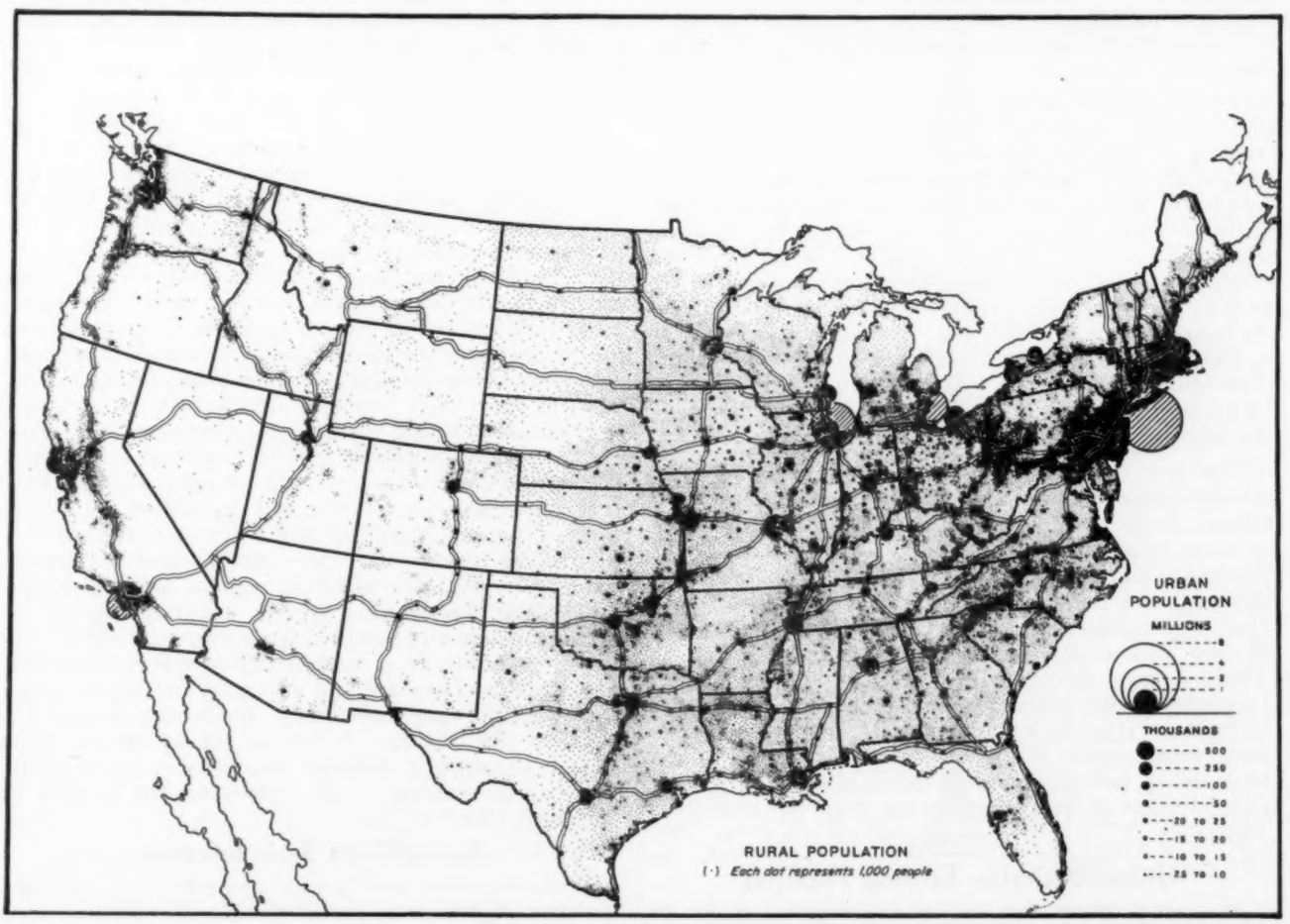


Fig. 2—The Selected System Touches Directly All Major Population Concentrations and Passes Through Counties in Which Are the Homes of 60 Per Cent of the Total Population.

The Pulaski Skyway in New Jersey Daily Pours One of the Largest Highway Traffic Streams in the Country Into the Holland Tunnel Under the Hudson River and Thence Into New York City.

the town streets. It is a traffic that in every large proportion has its origins or destinations, either ultimately or temporarily in the principal cities; and it demands, therefore, satisfactory facilities for entrance into and exit from such cities without annoying delays by traffic congestion.

Needed for the service of an important peace time traffic already developed, such an interregional system would also constitute the major arteries of the group of roads that would bear the brunt of the augmented industrial traffic and military movement in the event of a war in the national defense. Moreover, such military necessity is likely in the future to appear less as a remote contingency and more as an ever present and important basis of highway design, simply because our increasingly mechanized army will inevitably appear more frequently on the highways in its practice maneuvers. An important demonstration of what may be expected will be afforded by the large-scale maneuvers that are scheduled to be conducted this winter in the Southern States.

The first characteristic of the interregional system, desirable alike from military, economic, social, and recreational points of view, is that it shall connect by courses as direct as practicable the country's principal centers of population and industry. In addition, it is desirable that the routes of the system shall penetrate centrally into every significant region of the United States and provide in each such region convenient points of departure at which it may discharge and take on the burden of long-range traffic which it will accommodate from region to region. That the tentatively designated system meets these requirements with some success is shown by the intimacy of its association in location with the greater concentration of population in the map reproduced as Figure 2.

Utilize Desirable Existing Facilities

It is not proposed that such an interregional system be newly constructed throughout, separate from existing routes in all its sections. On the contrary, the system as ultimately developed should include to the greatest practicable degree existing roads on their substantially unchanged locations, and should incorporate to the fullest extent the improvements that have previously been made on such roads. The degree to which it will be practicable to utilize existing road sections, however, will vary considerably in different parts of the country.

In the populous east and west coast regions, and in the northeastern section of the country, a number of factors conduce to a probable necessity for the construction of many sections of the system on new location. Among such factors are the close proximity of small towns that should be bypassed, and the excessive curvature of the existing routes, many of which were durably constructed in their present locations before the speed of motor vehicles had been so increased as to make them the loci of hazards they have since become. Other conditions similarly conducive to the choice of new locations in these more populous sections are the fact that rights-of-way of the existing primary routes are predominantly the narrowest possible, and the further fact that accretions of road-bordering property improvements render excessively expensive and destructive acquisition of the wider and straighter land strips now required.

In other sections of the country these conditions, common in the more populous regions, are not present to anything like the same degree. Existing highway locations in these other sections conform much more closely to the requirements of modern vehicle speeds, and existing 2-lane surfaces are still adequate for the developed traffic and will long continue so. Indirection in these sections of the country is found mainly where what should be straight diagonal routes now follow stair-stepwise the existing roads located on the borders of rectangular land sections.

Factual Data Basic Influence

With the close and helpful cooperation of all state highway departments, the Public Roads Administration has gathered the various facts which indicate the general conditions prevailing at present on the existing roads

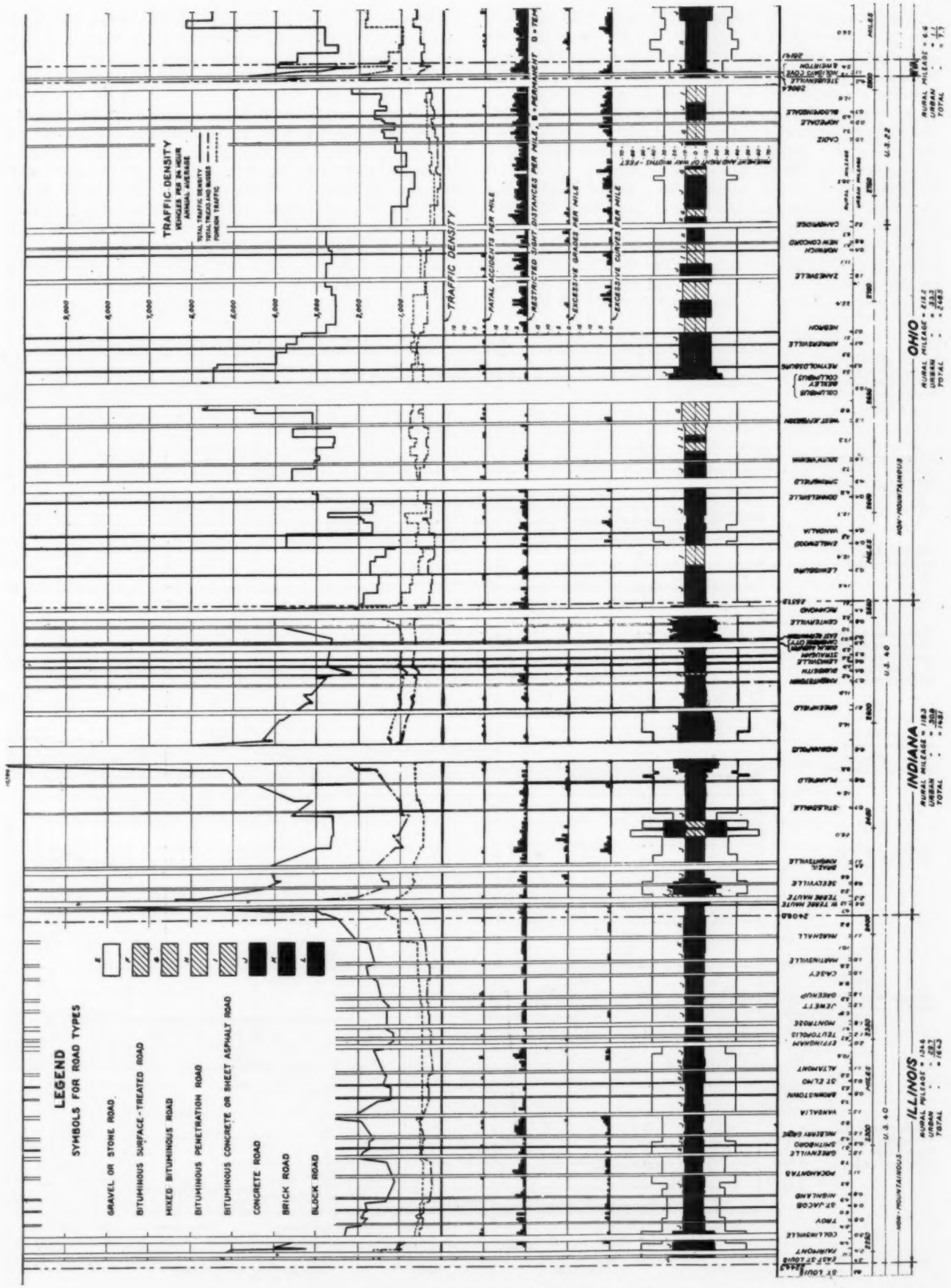


Fig. 3—A Section of a Condensed Diagram Showing the Condition of the Existing Road Approximating the Location of a Route of the Interregional System Extending from Philadelphia to San Francisco.

which approximate the various sections of the tentatively proposed interregional system. Route by route, the information compiled gives the width of right-of-way and surfaced width of the existing roads at all points, the physical character of the surface, the present existence of excessive curvature and gradient and significantly short sight distance, and the annual rate of fatal accident occurrence per hundred million vehicle-miles of traffic. For each section the present average daily volume of traffic has been compiled in total and as subdivided into passenger vehicles and trucks and local and "foreign" traffic in each state. This information already compiled as to the roads and road surfaces, is now being supplemented by information in similar detail with respect to the existing bridges, which will include the design rating of each bridge, its safe load limitation in its present state, its vertical and horizontal clearances, and magnitude and frequency of the critical gross loads and axle loads to which it is currently subjected.

Figure 3 shows the manner in which the data regarding roads and road surfaces are recorded on condensed straight-line diagrams for each section of the studied routes; and Figure 4 gives a graphical summary of the conditions found to exist at present on the existing roads approximating the location of the proposed interregional system. A brief study of this latter graph will show how erroneous would be the conception of such a system as a network of uniformly designed thoroughfares. Even in this group of important highways, composed generally of roads which are among the most heavily traveled of their respective regions, it will be seen that a large percentage of the mileage serves a present

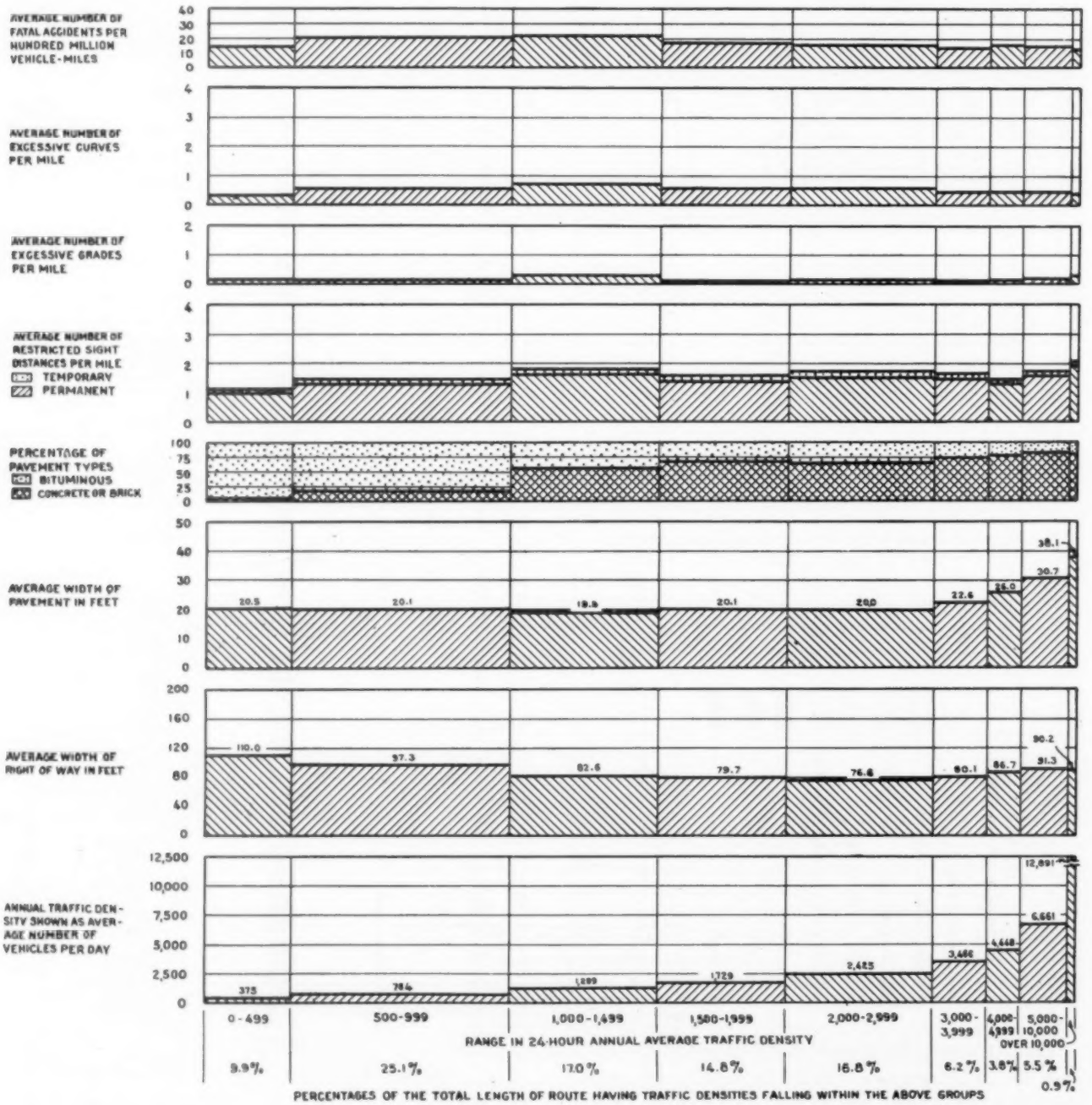


Fig. 4—Graphical Summary of the Condition and Traffic Utilization of the Total Mileage of Existing Roads Approximating the Lines of the Selected Interregional System by Traffic Density Groups.

traffic averaging less than 500 vehicles per 24-hour day; and a relatively small percentage carries more than 10,000 vehicles per day. But it is clear that the wide range of traffic volume calls for a variation in the design of road facilities of somewhat similar scope.

The greatest disparity between present physical capacity and traffic requirement is shown to exist in the analysis of the right-of-way situation. The greater right-of-way width now available where traffic is lightest, as shown in one part of the graph, reflects the relative narrowness of the old eastern rights-of-way on heavily traveled roads and the ampler widths of the acquired land strips in other sections where traffic is lighter. Existing surfaces of 2-lane width, shown to exist uniformly where average traffic is less than 3,000 vehicles per day, are reasonably consistent with traffic requirements, but the average width of pavements serving traffic of greater volume does not increase as largely as it should with increase in the traffic volume.

The general classification of surface types as between the two general classes represented confirms the average wisdom of type selection employed in the construction of the existing roads. But the conditions of curvature and sight distance again show the greater need of modernization that exists on the more heavily traveled sections of the system.

The traffic volumes used as the base of the graphical summary presented in Figure 4 are those observed at present on the existing roads approximating the location of the proposed routes. The designation of these roads as links in an interregional system and the improvement of the system consistent with the purposes of its designation would draw to these roads an addition of traffic over their present usage; and where the new routes are constructed on new locations the increase that would result from this cause would offset the loss of local traffic. The volumes of traffic now using existing roads approximating the location of various parts of the system is shown in Figure 5 by the width of the darker traffic bands representing the system against a background of the lighter bands representing the traffic use of other existing primary hghways of the United States.

Suggested Standards

The facts here briefly presented indicate that the proposed system, intelligently improved, would not conform to the somewhat popular picture of a transcontinental boulevard network of uniform and highly expensive construction. But this does not mean that the standard of design should not be consistently high in all elements having a bearing on the safe and convenient service of traffic moving at the high speeds that may be expected to prevail on such a system. The Public Roads Administration has suggested that curvature be limited to 3 degrees and gradients to 3 per cent wherever possible. Twelve-foot surface lanes, sight distances extended to greatest extent consistent with reasonable economy, and liberal criteria for the widening of surfaces from 2 to 4 and more lanes are also among the standards by which the relative adequacy of the existing roads approximating the system is now being tested.

The results of such tests, as previously suggested, show that the greater needs of modernization and also of improved directness of connection exist in those parts of the system that are at present the more heavily traveled, and greatest need of improvement is found to exist in the most important metropolitan areas. It is in these areas, accordingly, that the first improvements should logically be undertaken; and in them, as a matter of fact, they are already being planned and carried out by local and state initiative, as instanced by the Merritt Parkway in Connecticut, the Worcester Turnpike in Massachusetts, the Henry Hudson Parkway in New York City, the Pulaski Skyway in New Jersey, the improvement of U. S. route 40 in Delaware and Maryland, the Chicago-Milwaukee highway and other recently constructed facilities in other parts of the country. A number of such road sections would be incorporated in the proposed interregional system without substantial change of their present location. But even some of these roads would require further improvement by the widening of pavements, the separation of grades at highway and railway intersections, and by the easing of curves and grades and the lengthening of sight distances.

Municipal Constructions Most Urgent

Most needed and certainly most expensive of the improvements required are those that should be effected as promptly as possible in sections of the interregional system immediately approaching and extending through

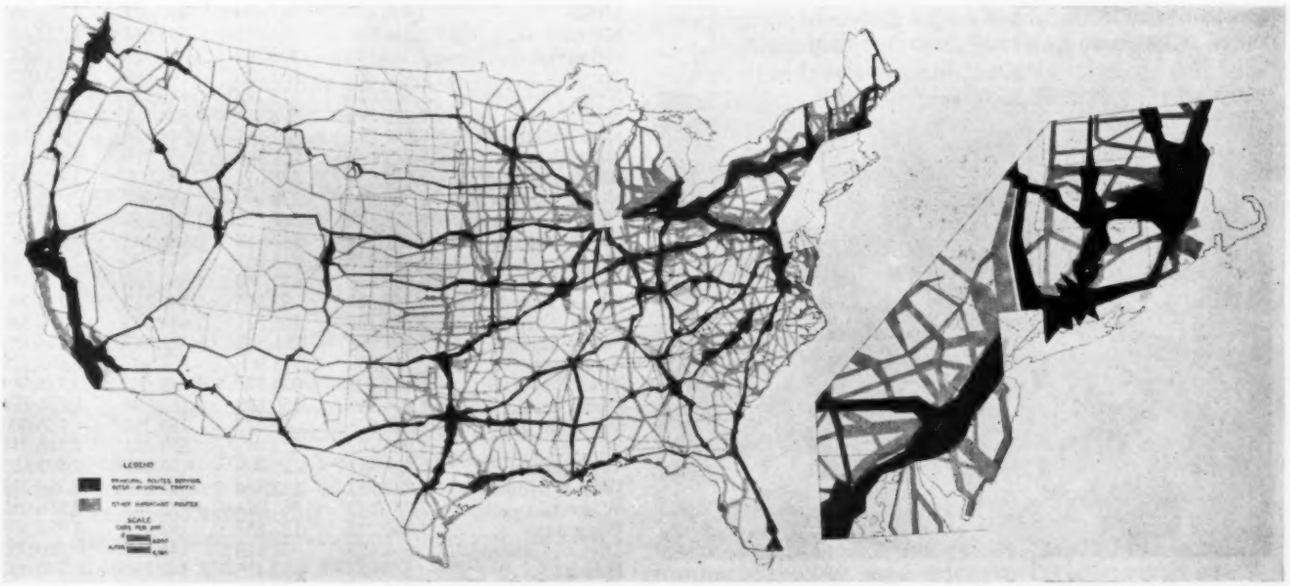


Fig. 5—Traffic on Existing Roads Approximating the Location of the Tentatively Selected Interregional Routes (Black Bands) Compared with the Traffic on Other Primary Highways of the United States (Shaded Bands.)

The Merritt Parkway in Connecticut, Newest of the Modern Limited Access Roads, Is One of the Country's Finest Rural Thoroughfares.

the largest cities of the country. On such occasions the improvements in many cases should provide for limitation of access to the express roadways with lateral service roads; and the frequency of crossing of other highways will necessitate the construction of the interregional route as either a depressed or elevated artery. Such construction, necessarily expensive, is yet viewed as of greater urgency than the simpler required improvements of the system, and it was this view that prompted the Public Roads Administration to suggest the provision of means by which the Federal Government could lend prompt and large financial aid to the states and cities, especially for the obtainment of the expensive rights-of-way required. The same purpose is the objective of identical bills introduced at the last session of Congress by Senator Hayden of Arizona and Representative Cartwright of Oklahoma, which would authorize the Reconstruction Finance Corporation to loan the money necessary both for land acquisition and construction either irectly or through the agency of the Commissioner of Public Roads. These bills are certain to be the subject of discussion and debate in this year's Congressional session; and one way or another the outcome of the consideration they will receive is likely to be a first step toward the improvement of such a system of interregional routes as has been generally described in this article.

View of a Depressed Express Highway Through a City, Facilities of This Sort, or Their Equivalent in Elevated Express Ways, Are Already Needed in Several of the Major Cities.

$156,000,000 FEDERAL AID APPORTIONED

Federal Works Administrator John M. Carmody on Dec. 28 apportioned among the 48 States, the District of Columbia, Hawaii and Puerto Rico, $156,000,000 for highway improvement and elimination of hazards at railroad grade crossings, available from appropriations authorized for the fiscal year beginning July 1, 1940, after deductions of amounts authorized for administrative expenses.

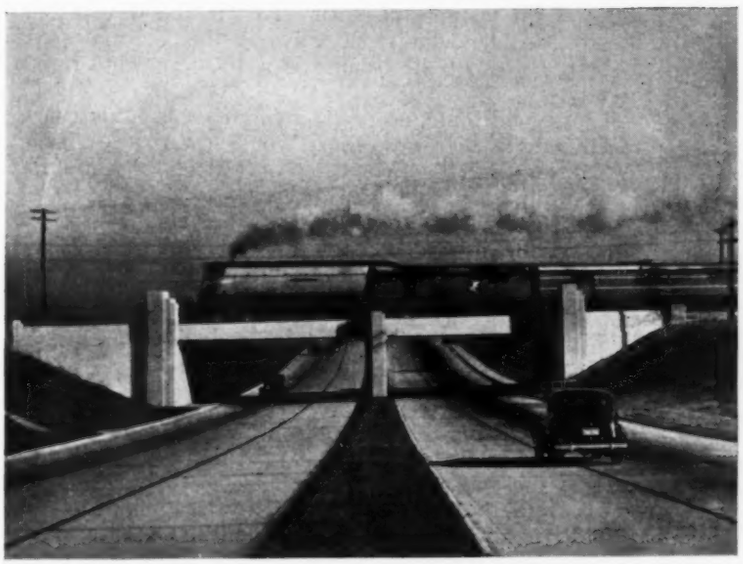
The apportionment was authorized by the Act of June 8, 1938, which provided $115,000,000 for improvement of the Federal-aid system and its extensions through cities, $15,000,000 for improvement of secondary or feeder roads, and $30,000,000 for elimination of hazards at railroad grade crossings.

Mr. Carmody also announced the apportionment of $2,000,000 to be expended in the 13 public lands States for construction of roads through public lands and Federal reservations.

The apportionment follows:

APPORTIONMENT OF HIGHWAY FUNDS FOR THE FISCAL YEAR 1941

State	Regular Federal Aid	Secondary or Feeder Roads	Grade Crossings	Total
Alabama	$ 2,380,349	$ 310,480	$ 589,270	$ 3,280,099
Arizona	1,637,140	213,540	191,626	2,042,306
Arkansas	1,955,081	255,011	510,125	2,720,217
California	4,367,576	569,684	1,111,429	6,048,689
Colorado	2,080,133	271,322	376,426	2,727,881
Connecticut	718,741	93,749	248,548	1,061,038
Delaware	560,625	73,125	146,250	780,000
Florida	1,548,961	202,038	416,288	2,167,287
Georgia	2,885,623	376,386	733,109	3,995,118
Idaho	1,410,297	183,952	242,861	1,837,110
Illinois	4,650,696	606,612	1,544,707	6,802,015
Indiana	2,788,741	363,749	758,563	3,911,053
Iowa	2,915,122	380,233	819,207	4,114,562
Kansas	2,977,130	388,321	756,758	4,122,209
Kentucky	2,093,355	273,046	534,074	2,900,475
Louisiana	1,652,720	215,572	464,383	2,332,675
Maine	1,002,926	130,816	202,164	1,335,906
Maryland	944,288	123,168	300,034	1,367,490
Massachusetts	1,580,826	206,195	610,114	2,397,135
Michigan	3,465,694	452,047	970,387	4,888,128
Minnesota	3,101,454	404,538	783,436	4,289,428
Mississippi	2,017,658	263,173	465,023	2,745,854
Missouri	3,430,445	447,449	890,471	4,768,365
Montana	2,330,932	304,035	396,693	3,031,660
Nebraska	2,328,430	303,709	522,486	3,154,631
Nevada	1,462,071	190,705	146,250	1,799,026
New Hampshire	560,625	73,125	146,250	780,000
New Jersey	1,520,740	198,357	584,751	2,303,848
New Mexico	1,843,554	240,464	248,930	2,332,948
New York	5,572,118	726,798	2,000,719	8,299,635
North Carolina	2,672,689	348,612	754,096	3,775,397
North Dakota	1,755,204	228,940	462,007	2,446,151
Ohio	4,118,378	537,180	1,249,549	5,905,107
Oklahoma	2,671,591	348,468	685,148	3,705,207
Oregon	1,884,937	245,861	335,220	2,466,018
Pennsylvania	4,853,536	633,070	1,690,736	7,177,342
Rhode Island	560,625	73,125	146,250	780,000
South Carolina	1,528,126	199,321	444,883	2,172,330
South Dakota	1,851,590	241,512	401,477	2,494,579
Tennessee	2,391,758	311,968	559,502	3,263,228
Texas	7,163,707	934,397	1,630,426	9,728,530
Utah	1,294,360	168,829	193,595	1,656,784
Vermont	560,625	73,125	146,250	780,000
Virginia	2,085,702	272,048	558,591	2,916,341
Washington	1,809,062	235,965	450,343	2,495,370
West Virginia	1,245,713	162,484	391,518	1,799,715
Wisconsin	2,771,243	361,466	725,347	3,858,056
Wyoming	1,440,222	187,855	197,023	1,825,100
Dist. of Columbia	560,625	73,125	146,250	780,000
Hawaii	560,625	73,125	146,250	780,000
Puerto Rico	560,625	73,125	224,207	857,957
Total	$112,125,000	$14,625,000	$29,250,000	$156,000,000



Grade Separation on U. S. 41, Skokie Road, Chicago to Milwaukee Highway. On the 160-ft. Right-of-Way, This Underpass Separates Interregional Traffic with the Chicago, Milwaukee, St. Paul and Pacific Railway.

INTERREGIONAL HIGHWAYS

From The Municipal Viewpoint

Metropolitan Chicago Anticipates the Inter-Regional System

By ROBERT KINGERY
General Manager Chicago Regional Planning Association

DARING design and courageous action are required of city, county and state highway officials to thrust into large cities the interregional highways that are needed by modern traffic.

Superhighways, parkways, freeways in the suburban areas of metropolitan centers have become familiar to most highway authorities. Outside the cities of the United States, highway service has been fairly well developed. Inside most big cities the traffic still moves on surface streets with the directions of traffic undivided. New York City has successfully penetrated the congested area with a limited-way on the rim of Manhattan Island, where a wide right-of-way was readily available. Chicago's lake front, Cleveland's lake front and other natural waterside locations have been the scenes of similar parkway designs. Few large cities are so fortunate, especially for a well rounded system of broad highways radiating in all directions from the central business district.

Metropolitan Chicago Is Typical

Just as Commissioner Thomas H. MacDonald of the Public Roads Administration took Baltimore as an example in his study, "Toll Roads and Free Roads," this statement chooses Chicago to exhibit conditions that are typical of many other metropolitan centers. All of them need treatment. Perhaps the 20 largest cities of the United States need major operations. Perhaps the next 50 need to be attacked in like manner. Most of the first 20 will be on any main interregional highway system.

Chicago's great south side, southwest side, west side and northwest side are densely populated, the people are packed into the typical gridiron pattern of streets. The historic diagonal highways, now city streets, are narrow for present day traffic needs, are bordered by business property for the most part, would be expensive to widen and would not be safe or practical for limited-way purposes if widened.

Within Chicago a major operation is about to be performed, not merely scraping off the fronts of buildings and lots to develop a slightly widened street incapable of carrying great volumes of traffic at highest speeds and with greater safety. Rather this operation is designed to take broad rights-of-way, at least seven in number, radiating from the central business district, the rights-of-way being great enough to provide not less than four lanes of traffic in each direction, with belts of green to separate them from local access streets serving the adjacent property. This major operation has been completely laid out and details of each unit are being designed. The courageous action now needed is on the part of the Mayor and Council, who must give the word to complete the detailed drawings, buy the rights-of-way and start construction.

The system in any city would take similar basic pattern although, of course, not identical. The bulk of the traffic to that city wants to go to the large central district. It is local traffic in large quantity. That part of the traffic approaching the great city which wants to go through or beyond must have two choices: either to go directly through on a safe, rapid, continuously grade-separated route, preferably of park-like character, or to skirt the built-up area on a bypass route, also safe, grade-

separated, parklike in character, capable of carrying traffic at sustained speeds.

Chicago's Exterior Regional Highway System

Outside of Chicago, but in a fifty mile wide suburban belt around the city itself, a system of superhighways or parkways laid out twelve years ago, has been gradually unfolded as state and county funds have been made available during the past twelve years.

Highway officials of the States of Illinois, Indiana and Wisconsin, and county highway officials of many of the counties have been acquiring rights-of-way, building pavement and constructing railroad and highway grade separations on a 550 mile system. Of these 550 miles, approximately 180 miles of right-of-way are available, as of January 1, 1940. This right-of-way is from 160 feet in width up to 250 feet. Of the 180 miles, pavement has been laid on 160 miles, either a single four-lane pavement in the center of the right-of-way, or a

Broad Highway System for the Region Around Chicago.

divided four-lane or six-lane pavement, or the first two-lane pavement of an ultimate divided pavement.

The system as laid out and on which many units have been built, consists of ten radial highways all pointing toward central Chicago. The main specifications for this system have been: broad right-of-way to permit the divided pavement and also access roads adjacent to the property lines; grade saparations at every railroad, and at every major highway; the pavement capable of speeds of 45 miles an hour or greater; the roadsides graded and landscaped to make a pleasing treatment which would enhance rather than injure values of adjacent property.

Counter-clockwise around the city, the first completed pavement is the northerly inter-regional highway, the Chicago-Milwaukee route, a divided pavement for 70 miles of the 90 mile distance. Part of the way it is a broad, parklike lake front drive in the Chicago park system. Most of the balance is a 160-foot wide right-of-way.

The second route, no part actually completed, is a new northwesterly highway which would connect Madison, Wisconsin, and the twin cities of Minneapolis and St. Paul, Minnesota, directly with Chicago.

The third route, leading also to the northwest, is a road leading toward Rockford, Freeport and the Mississippi River. Twelve miles of the 240-foot right-of-way have been provided in Cook County and two lanes of a future divided four-lane pavement were constructed in 1939 and opened to traffic.

The fourth route, almost due west, is North Avenue, which leads east from the Fox River. A majority of the distance this is a 200-foot wide right-of-way with a four-lane pavement divided part of the way, and united part of the way.

The fifth route is Butterfield Road leading from the Fox River toward Chicago and aiming at a broad connection along Harrison Street. Fifteen miles of 200-foot right-of-way are owned, five miles are paved with the first two-lane pavement.

A sixth route, southwest, is the 200-foot wide right-of-way across DuPage County, about five miles existing, on 75th Street, and nearly three miles paved across Cook County on 71st Street. This is to lead into the Illinois and Michigan Canal, 240-foot right-of-way with a pavement on the towpath on each side of the old canal.

The seventh exterior highway is the St. Louis-Springfield-Joliet-Chicago route which is to penetrate the metropolitan center by way of the Illinois and Michigan Canal and which will also connect to the 200-foot wide, four mile long, George Brennan Highway route, serving the southerly part of Chicago.

The eighth route is an extension of Stony Island Avenue due south from Jackson Park into southern Cook County and continuing to Indianapolis, Terre Haute, Evansville and the south.

The ninth route is the Lincoln Highway, U. S. 30, now rebuilt in Indiana from a point a little east of the Illinois-Indiana state line to a point a little beyond Valparaiso. Construction work now under way will permit the opening of this completed route, 23 miles long, early in 1940.

The tenth inter-regional highway is to the south, as close to the shore of Lake Michigan as a broad right-of-way can possibly be obtained through this great industrial section. It follows generally the valley of the little Calumet River through southerly Hammond and Gary, and it is proposed to extend this route east past LaPorte, South Bend, Mishawaka and Elkhart connecting with U. S. highways in that location, thence on to Detroit, Toledo, Cleveland, as shown by the Public Roads Administration studies.

Connecting the first radial with the tenth, as listed above, is a great belt line route, 70 miles long, skirting to the south and west of the thickly built up metropolitan area. It intercepts every other radial, serves as a distributor, and 24 miles have been built on a 200-foot right-of-way.

Extending the Exterior System Inside Chicago

For some years state and county officials have not felt sure enough of the superhighway plan inside Chicago to dare to penetrate too far with these exterior superhighways. An accepted comprehensive plan for a city system was needed. It has now been developed. Inside Chicago the pattern chosen and described by the

city's Commissioner of Superhighways follows very closely a number of previous reports on the subject, harmonizes all or most of them, varies somewhat in detailed location, but for the first time crystallizes and brings general harmony about a comprehensive design.

The system calls for seven radial highways and one belt or cross town route. Again, backing around the clock, the first or north unit of the interior system extends the Outer Drive to the north city limits and contemplates connections with the major Chicago-Milwaukee route.

The second, to the northwest, will feed both the Milwaukee route and the Madison, Minneapolis, St. Paul route. It will also serve as a distributor for the third exterior superhighway which serves Rockford, Freeport and points west.

The third is a west side superhighway leading from the northwest corner of the central business district and connecting with the North Avenue exterior highway.

The fourth is another west side route leading from the southwest corner of the central district directly into the Butterfield Road broad highway, the number five exterior route.

The fifth is the southwest route utilizing the Illinois-Michigan Canal banks, connecting to the 75th Street route across DuPage County and also serving as a feeder to the Joliet-Springfield-St. Louis highway. A southerly branch of this route will also lead through that built-up section of the city toward central Illinois.

A sixth is a southerly route connecting Stony Island Avenue with the Outer Drive.

The seventh is the extension of the Outer Drive along the shore of Lake Michigan and west of the steel mills to the Indiana state line serving the great Indiana sector of the region and continuing to the Indiana exterior highways.

The cross-town or belt route is to the west of the central business district and is contemplated for later construction.

Effect on Metropolitan Area

In planning a system of interregional highways either within or outside of the built-up section of a metropolitan area, consideration must be given to the effect such limited highway facilities will have upon each terminus of each route, as well as upon the property adjacent

Where Sufficient Right-of-Way Is Available, Highway Engineers Recommend a Parkway, on Divided Lane Highways, Wide Enough to Keep a Car Clear of Both Lines of Traffic When Crossing from One Lane to Another. This Amply Wide Construction Is in Wisconsin on U. S. 41 Just South of Milwaukee. The Dividing Strip Is 50 Feet Wide.

Stony Island Avenue, Chicago, 95th St. to 130th St., Skirts the Industrial Area Allowing Free Traffic Flow Into and Out of the Metropolitan Center.

and nearby. For that reason, those state and county highway officials who have been working on the exterior highway system, have definitely given each of these routes a right-of-way as broad as could be justified. Great widths permit separation of directions of traffic, good design of grade separations at railroads and highways and sufficient space for pleasing roadside grading and planting of sod and trees.

These same principles are being applied to the designs for each unit of the interior Chicago system. That is why we call the design daring! Much of the distance the route will be at least one-half block wide, even more will be a full block wide, four hundred feet or more. Many residences and a few industrial sites will be dislocated. Rights-of-way, demolition of buildings, adjustment of many underground facilities are costly, delays will occur in the rights-of-way purchase, but the design should not and will not be skimped for the sake of speed. Too much of the entire economic future of Chicago is at stake!

This is true, not only in the Chicago picture but in every great city. Near the city's center a substantial part of the city superhighways will extend through the older neighborhoods. Here in Chicago a belt three or more miles wide and some ten miles long around the central business district lost more than 260,000 population in the 20 years between 1910 and 1930. The past decade has probably seen as great an exodus. Many of the older buildings in that area, residences as well as business and factory structures, have been torn down. Large open spaces appear in many of the blocks. A broad swathe for highway purposes through such area can be designed so as to do no damage and may well be designed so as to enhance the values of those decadent areas and help restore them to a tax paying condition.

Radical, courageous amendments to the present Chicago zoning ordinance, bold alterations in the street layout by developing super-blocks and stub-ending a number of relatively unimportant streets, the introduction of new playgrounds and parks will follow the development of superhighways without a doubt. The city superhighway will not do this work but it will inspire it. The city officials who have to do with the zoning and with the layout of streets, and the parks officials who have to do with park and playground areas will undoubtedly develop a parallel program to the superhighway scheme.

Unless this is done within the city of Chicago (and the same might be said for most of the big cities of the country) they will continue to lose population in their

central areas. The central business district will continue to lose patronage because the purchasing population is moving farther and farther away.

Suburban Region Has Anticipated Rapid Growth

Outside the city of Chicago and in the suburban municipalities the Regional Planning Association has anticipated this for some 15 years. City after city bordering Chicago and radiating from Chicago, has adopted major street plans and construction programs, has controlled the subdivision of land into comfortably sized residential lots, has zoned its area giving residential sections sure protection from invasion by less desirable uses. A majority of the suburban communities within fifty miles of Chicago has acquired parks and playgrounds in anticipation of a sharp increase in the local population.

Traffic flows both ways on the interregional system of highways whether they be superhighways, boulevards inside the central city or in the suburban and rural area.

Congestion in the Environs of Chicago on Route U. S. 20, Washington Boulevard, Oak Park, Ill. In This View, Looking East, May Be Seen the Need for Municipal Extensions for Fast Traffic.

The great central city is the essential heart of a metropolitan area. Important also are the suburbs, and so is the unincorporated rural area.

Radial superhighways within the city offer the opportunity to protect the regional value of the central business area by making it more accessible to the population which is gradually moving farther and farther away. The mistakes of earlier city home building, mostly on lots too narrow for adequate light, air, fire protection and good health may well be revised. The out-flow of population from the central district where congestion was greatest is in one respect a very healthy movement. It makes possible the restoration of a sound population growth in the area immediately around it, by learning from experience and not repeating those early home building mistakes.

In these areas to be restored, much of the heavy flow of traffic on its streets will be bypassed. It will be lifted up or depressed on these superhighways. The surface streets will continue to carry traffic, but the fast moving traffic will be segregated into the "limited" arteries. Then the city, through its map department and through the cooperation of large and small holders of property, will undoubtedly make a conscious attack on the re-subdivision of many blocks into more usable residential areas free from the depressing influences of heavy volumes of traffic.

The Chicago metropolitan area is a hub of many cross-country and interregional highway routes. East and west travel from the Canadian line on the north to almost the middle of the United States must bend to the south around the Great Lakes.

On the Great Lakes both to the east and to the north and west of Chicago are located other large metropolitan population centers. Highway traffic in great volumes flows between these centers and Chicago. Any nation-wide system of interregional routes automatically reaches Chicago directly or indirectly. The suburban superhighway plan has anticipated these needs and although in no way is it complete, great progress has already been made. The next great need, now at the point of being satisfied, is inside the traffic congested city of Chicago and in all other great cities.

No more worthy scheme can be planned by the highway engineers during the next two decades.

▼

Mexico and the Control of Roadside Advertising

In a paper presented at the annual convention of the American Automobile Association, Mr. M. E. Bracho of Mexico gave a brief outline of the steps the Republic of Mexico has taken in relation to the control and regulation of roadside commercial advertising along its national highways, states Information Exchange, medium of the Texas State Highway Department.

Based on the constitutional principle that "the nation shall have at all times the right to impose on private property such limitations as might be demanded by public welfare, . . . etc." and further backed by the Acts and Regulations of Communications and Public Works, fifteen brief and simple regulations for the curtailment and control of roadside commercial advertising have been adopted. These regulations are based on traffic safety and the prevention of disfigurement of the beauty of the landscape. The most important of these regulations are as follows:

These regulations extend to private property adjoining the right-of-way of national roads, restricting and preventing the exhibition of advertisements in any region where the scenery may be injuriously affected.

Archeological zones, historical monuments, National Parks and points of rural interest are protected against advertisements.

Alongside highways and starting three kilometers (1.86 miles) from municipality limits, signs will be allowed only in zones 200 meters (646 feet) long. Distance from the center line of the highway for their location is fixed at 50 meters (164 feet). In straight ways of less than 5 (3.11 miles) and no more than 3 kilometers (1.86 miles), just one zone will be allowed.

In the inside and outside of curves, no matter what their degree may be, there shall be no commercial signs of any kind.

No signs can be erected 150 meters (492 feet) from the PC of any curve. Nor 150 meters on either side from a railroad crossing, road crossing, junction, or side road.

Maximum surface of a panel to be not more than 60 square meters (646 square feet). The frame must be steel and the whole of harmonious appearance.

Use of lights and reflectors prohibited. Use of words similar to those of highway signs also prohibited.

No signs, posters, panels, etc., can be painted, hung or constructed on rocks, hillsides, trees, etc.

A license will be paid by advertisers annually; also individual quotas per advertisement.

Trucks of Only One Battery, Requiring Most of the Roadway Width, En Route on Change of Position

INTERREGIONAL HIGHWAYS

National Defense Requirements In Relation to System

By VICTOR J. BROWN
Major, 531 C. A. (AA), Publishing Director, Roads and Streets

IN 1922 the War Department completed a study, in collaboration with the then U. S. Bureau of Public Roads, the purpose of which was to advise state and federal agencies relative to highways of value to national defense. The study was based upon certain general principles mutually agreed upon by the War Department and the U. S. Bureau of Public Roads—now the Public Roads Administration. In substance, the most important of these were:

1. The highways which are most needed or which must be constructed for commerce and national development will, in general, be identical with those required for military purposes.

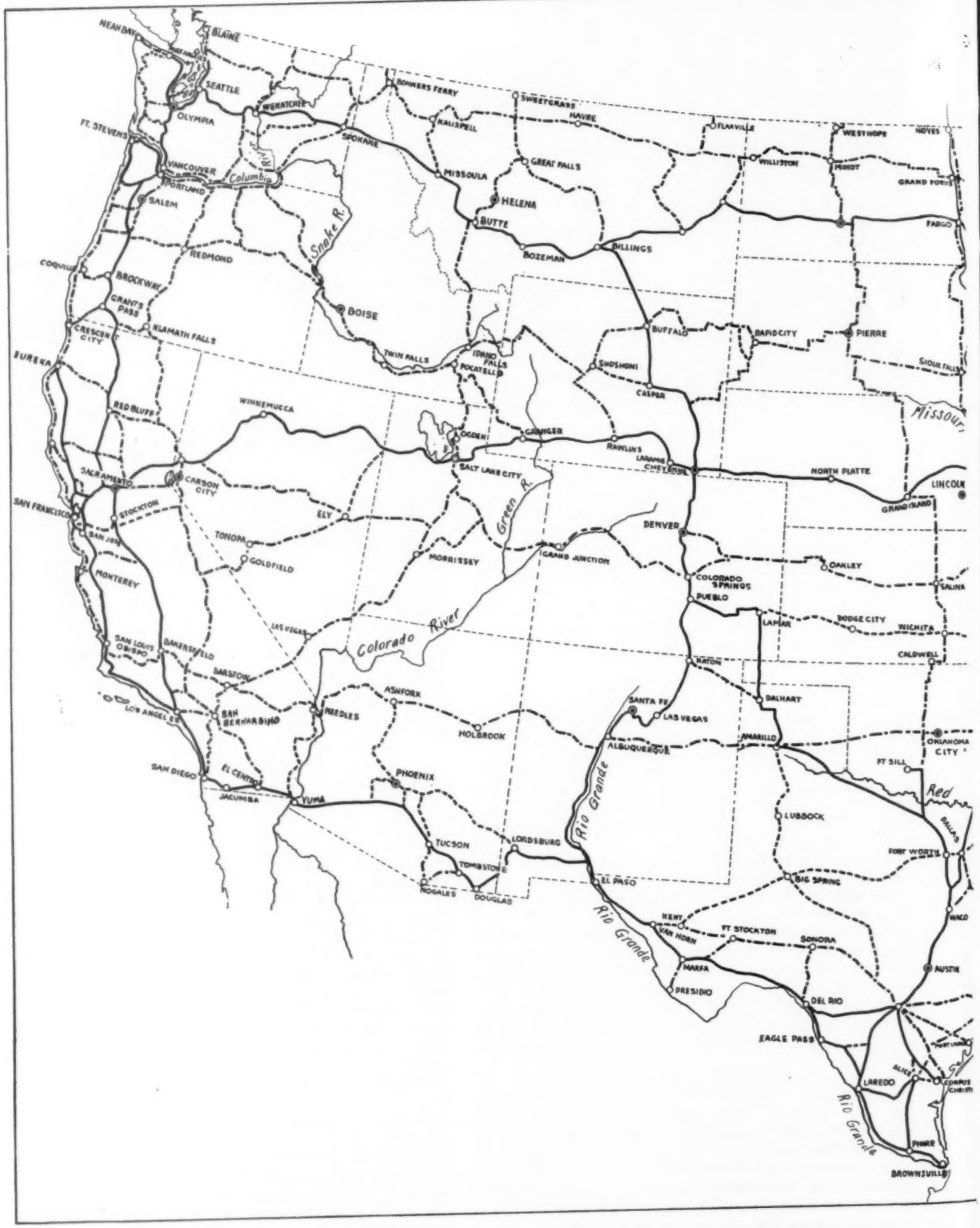
2. The location of highways and their priorities of construction is a matter for determination by the state highway authorities and the Public Roads Administration. This being the case, the War Department refrains from recommending particular highway construction projects or even particular routes upon which to locate highway projects, except in the most critical strategic areas.

3. A general network of good roads connecting important depots, and mobilization and industrial centers, has more strategic value than transcontinental highways which merely cross the country from coast to coast or from pine to palm without consideration for the points of supply or concentrated activity. A system of high standard roads connecting the principal centers of production or supply with vital strategic areas has considerable commercial, as well as military, value.

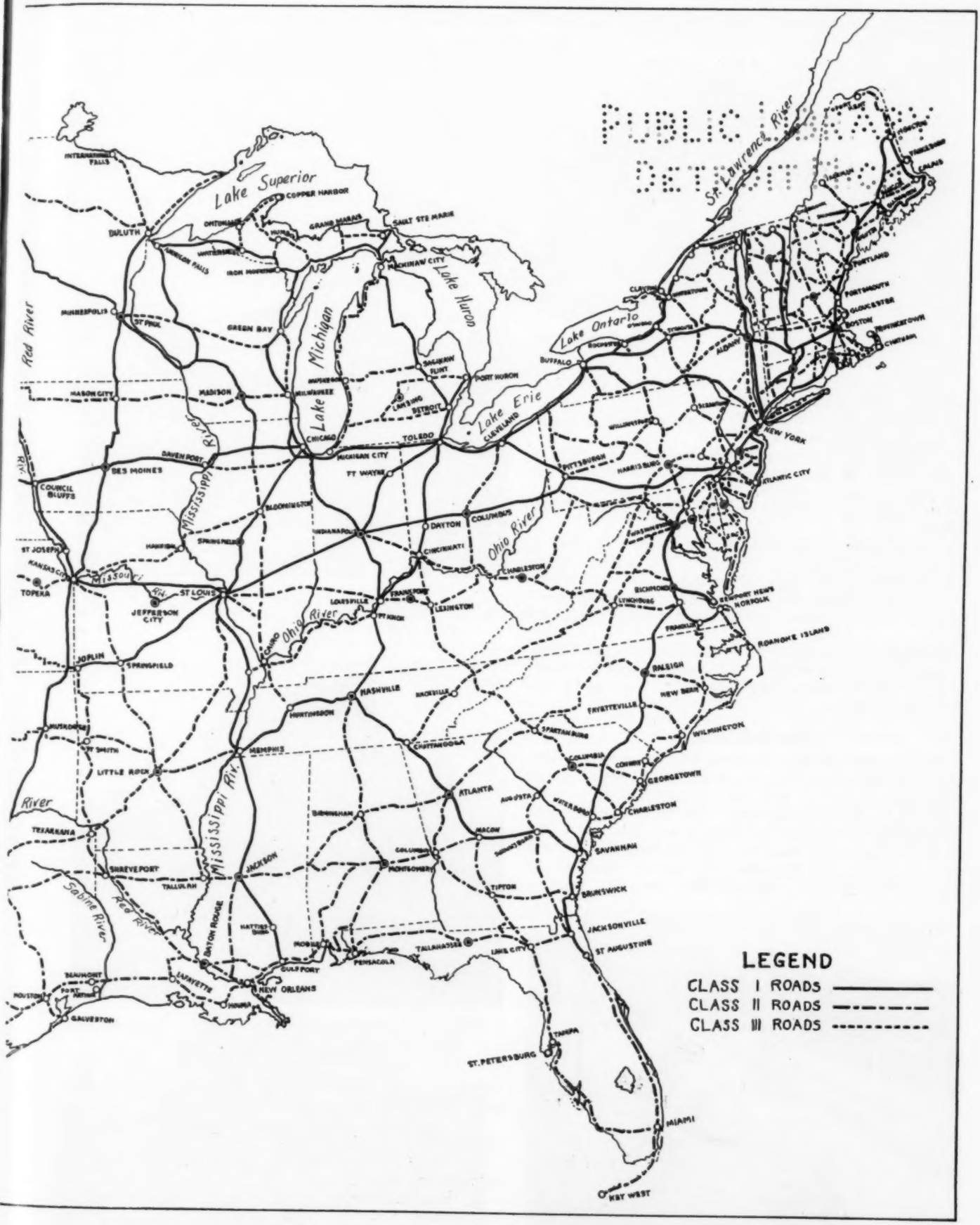
4. The primary interest for national defense, so far as roads are concerned, is the construction and maintenance of highway facilities which will permit free and unobstructed access or transportation between important strategic points and vital areas.

Special Highway Map

A direct result of the study was the preparation of a so-called "Pershing Map." In 1935 it was revised to show desirable priorities of construction. The latest revision, the Special Highway Map, was approved in September, 1939. The map shown herewith is not an exact reproduction of that map. The road systems shown, however, coincide with those of the Special Highway Map which was prepared in close collaboration with the Public Roads Administration and it is important to note that the general routes indicated are *not,* as frequently inferred, *military roads.* The routes indicated coincide as nearly as can be shown, with existing highways. *There are no military roads, as such, in the continental United States.* The primary purpose of the Special Highway Map is to provide governing road, street, and highway authorities with information concerning roads that have strategic value from the point of view of national defense. Except in a very few cases, the road system indicated has important commercial, recreational and civil utilitarian value to the nation. Comparison with the approxmately indicated interregional highways will show how well the suggested approximate interregional routes satisfy the indicated desirable highway routes for national defense. It is hoped that street and highway construction and maintenance authorities will give favorable consideration in their future programs to the routes and standards of construction desired. Minimum desirable standards of construction are as follows:



Special Highway Map Showing Main Traffic Routes Having Military Importance for National Defense



Special Highway Map Showing Main Traffic Routes Having Military Importance for National Defense

Infantry Tanks Lining Up Ready for Maneuvers. These Units Travel at Speeds Up to 40 m.p.h.

a.—*Surface.*—Hard surface, capable of supporting a 9,000-lb. wheel load on pneumatic tires.

b.—*Width*—Minimum of 20 ft. bridges to be 4 ft. in excess of approach roads.

c.—*Bridge Load Capacity.*—Minimum H-15 loading.

d.—*Grade.*—Non-mountainous areas, maximum of 5 per cent in lengths greater than 500 ft.; mountainous areas, maximum of 8 per cent in lengths greater than 500 ft.

e.—*Curvature.*—Non-mountainous areas, maximum of 6 degs.; mountainous areas, maximum of 14 degs.

f.—*Vertical Clearance.*—Minimum of 14 ft.

g.—*Sight Distance.*—Non-mountainous areas, minimum of 1,000 ft.; mountainous areas, minimum of 650 ft.

War department agencies responsible for the design of military vehicles will give full consideration to limitations on weight, height, and wheel load imposed by the foregoing standard.

Needed Work

Many miles of high standard highways are already built, but also many of them contain bottle necks through cities and towns, as well as bridges and on short stretches on the open highway. The writer happened to be standing on a corner in a county seat down on U. S. 30 in Pennsylvania early this fall when the motorized units, following the Manassas war games, were returning to their stations. All day long the 500 vehicles passed through at intermittent intervals. The mountainous areas and insufficient widths at bottlenecks hampered their progress as a continuous caravan. In this particular area the new Pennsylvania turnpike (tunnel highway) will relieve this condition, when it is completed. But that is only one of that kind of interregional roads. There are yet many sections of the strategic system in need of improvement.

In addition to these needed improvements the War Department committee recently appointed by the chief of staff to collaborate with the Public Roads Administration and the highway transport committee of the American Association of State Highway Officials has under consideration the following:

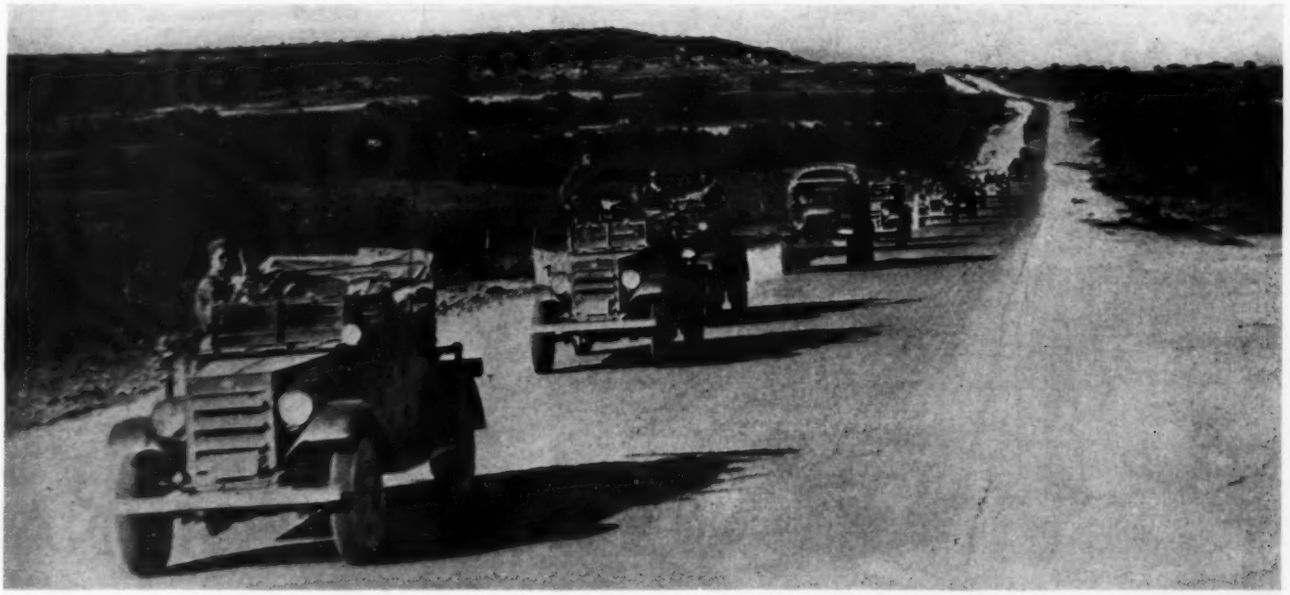
1. Road and street requirements in the vicinity of military posts and garrisons.
2. Highway requirements in the vicinity of proposed mobilization centers.
3. Road and street requirements for traffic service in important war-time industrial areas.

Roads in the neighborhood of military posts and proposed concentration centers are called, for convenience, access roads. In many instances, the roads or streets needed do not exist or are inadequate in the event of

With Adequate Highways, Convoy Trucks Can Be Given Fast Clearance and Avoid Congestion at Intersections

Antiquated Bridges Impede Progress. Only One Tank at a Time May Cross This Old Pin Connected Through Steel Truss Over the Saranak River.

In 1919 on a Trans-continental Trip the Motor Transport Had These Difficulties. A Good Interregional Highway System Will Prevent This.



A Calvary Squadron Enroute Uses Half of Wide Roadway as Far as the Horizon. Such Equipment Moves Much Quicker and with Greater Time Accuracy on Good Roads.

an emergency. Well do many engineer officers and world war coast artillery officers recall the plank access roads that had to be built in old Camp Eustice and Camp Humphreys. Construction of access roads already planned would facilitate troop training and diminish traffic hazards in congested training areas. In the interest of national defense, road and street authorities should give consideration at this time to the construction of these essential access roads. Though not a definite link in the interregional roads they may be considered a part of them because in time of emergency they will become integrated with the strategic road network.

In some centers, industrial mobilization will undoubtedly create additional traffic resulting in considerable highway traffic congestion. By keeping this in mind, the highway authorities can plan against road destruction from probable industrial loads, because the War Department has already furnished the Public Roads Administration with information concerning probable total loads and wheel loads which would be generated by war-time procurement activities.

Mechanization

Broad programs of motorization and mechanization now underway increase the need for adequate roads in military operations. This need carries beyond the interregional system to the more important state and county road nets. Speed of army maneuvering has progressed from the ox cart at 2 miles an hour to the staff car at 70 miles per hour; from the division moving 20 miles a day to division with more than 1,300 vehicles traveling 320 miles in 14 hours. To accomplish this mileage in rush movements from one section of the country to another, interregional highways will play an important part.

Bridges Not Up to Standard in a Desert Country Cause Unnecessary Costly Delays. This Picture Was Taken Somewhere in Nevada in **1919.**

Orders already have been issued for the reorganization and "streamlining" of five Regular Army divisions. That means that supply trains and cavalry will move at very greatly increased speeds—farther and faster. Mobility, speed, and fire power at the right place are factors of prime importance in modern national defense. Our standing army is small, practically insignificant in numbers, compared with the masses of troops assembled by other World Powers. Consequently there is all the more reason that our highways should be such as to permit, without failure or congestion, swift concentration, at maximum strength, and fire power needed to defend any threatened point.

Summary

From the viewpoint of national defense:

1. Interregional highways suggested closely approximate the stategic highways indicated by the War Department.
2. Existing deficiencies in the strategic system should be eliminated.
3. Projects for the construction of access roads deserve serious consideration insofar as they are practicable and consistent with commercial and recreational demands.
4. War-time industrial procurement will throw added burdens and loads in important industrial areas. These should be considered in future development work in those areas.

The American people, we believe, solidly support the proposition that the United States of America should take necessary measures to insure the adequacy of our national defense. Highways constructed to the minimum standards indicated herein are an integral, and important, part of national defense measures. Interregional highways when conforming to indicated commercial, recreational, and social needs closely fit into the pattern of strategic defense highways.

Flowering Rhododendron Frames the Road, in Great Smoky Mountain National Park, From Newfound Gap Toward Gatlinburg.

INTERREGIONAL HIGHWAYS

Recreational Value As Related to the Federal Park System

By ARNO D. CAMMERER

Director, National Park Service

WITH the phenomenal recreational development of the Federal and state park systems in recent years, made possible to a considerable degree through allotments of funds to the National Park Service by the Public Works Administration, Civilian Conservation Corps, and Emergency Relief Administration, there has been a commensurate increase in the need for better road systems linking together these vacationing grounds located in every state in the Union.

Annually millions of persons visit the numerous scenic, historical and scientific areas comprising the Federal park system administered by the National Park Service, a bureau of the United States Department of the Interior. During the 1939 travel season more than fifteen million persons enjoyed the recreational facilities offered in these areas, a large proportion arriving in their own automobiles.[1] In addition millions of others used the recreational facilities offered in the more than thirteen hundred parks and related recreational areas maintained by the various states.

EDITOR'S NOTE

In this article Mr. Cammerer describes many of the parkway highways built for pleasure seeking traffic. A glance at the map mentioned at the end of this article when compared with the suggested interregional highway system will quickly indicate the utility of interregional highways for making rapid connections between recreational areas. Vacationing motorists could, if the interregional system existed, travel rapidly from one national park, monument, or other area in one part of the country to a similar area in another section without undue loss of travel time and actually "See America First."

National parkways are cooperative Federal and state undertakings, the states furnishing the necessary rights-of-way and scenic easements, with construction financed by the Federal government. Three elements distinguish these national parkways from the common road, i.e., sufficient width of park land to provide a protective "buffer" on both sides of the paved motorway; the elimination of principal road crossings by means of bridges over or under the parkway; and the spacing of access roadways at infrequent intervals to minimize the friction with the main traffic stream. Of the three principles, that of the broad insulating park strip is considered of greatest importance in these parkway designs.

Three major national parkways—the Blue Ridge, the Natchez Trace, and

[1]The Federal Park System, comprising nearly 21,000,000 acres, includes 25 national parks, 4 national historical parks, 80 national monuments, 11 national military parks, 7 national battlefield sites, 4 national historic sites, 1 national recreational area, 8 national memorials, 11 national cemeteries, 3 national parkways, and the system of National Capital Parks in and adjacent to the District of Columbia. The 1939 travel figure of 15,000,000 does not include those persons using the system of National Capital Parks or the completed sections of the national parkways.

the George Washington Memorial Parkways—are now being constructed by the National Park Service.

The Blue Ridge Parkway will connect Shenandoah National Park, Va., and Great Smoky Mountains National Park, N. C.-Tenn., and will be within a day's driving distance of sixty million persons. When completed, it will be possible for motorists to travel over a continuous parkway from Front Royal, Va., to Gatlinburg, Tenn., a distance of approximately 615 miles. Of this mileage, 483 miles represents the Blue Ridge Parkway proper, 97 miles the famous Skyline Drive through Shenandoah National Park, and 35 mile a stretch of scenic highway in Great Smoky Mountains National Park. One of the longest roadway developments as a single unit in American road building history, the Parkway will also be the highest road in the East, averaging 2,500 feet and climbing in several sections higher than one mile above sea level. Viaducts, tunnels, retaining walls, and hand-laid rock embankments will gear the drive to modern automobile requirements, and it will be free of sharp curves and steep mountain grades.

Recreational areas several square miles in extent with

View from Cameron Lake Road, Glacier-Waterton International Peace Park.

picnic and auto camp grounds, lakes for boating, and foot and bridle paths are being developed along the parkway at intervals of 20 to 30 miles. Service stations, food shops, and in a few isolated locations, modest lodging accommodations, will be provided to complement those of nearby resort towns.

Sections of the parkway totalling approximately 100 miles were completed and in use this past summer and fall, and traffic counts made by National Park Service technicians reveal that nearly 300,000 persons visited the parkway during that period. Next spring it will be possible to motor over 140 continuous miles from a point on Bent Mountain, south of Roanoke, Va., straight through to Boone-Blowing Rock-Linville resort area of North Carolina.

The Natchez Trace Parkway will connect Nashville, Tenn., with Natchez, Miss. These two states and Alabama are furnishing the necessary right-of-way. This parkway will be 455 miles long and will follow to a considerable extent the Old Natchez Trace, historic Indian trail. Thus far approximately 36 miles located in Mississippi have been graded and surfaced and an additional 11 miles are under contract for grading in that state. Tennessee and Alabama are acquiring necessary lands for the parkway so that construction may be initiated as soon as possible in those states.

The 15-mile-long Mt. Vernon Memorial Boulevard, a paved 40-foot roadway connecting Mount Vernon with the Nation's capital and officially opened to travel in 1932, is the first link in the George Washington Memorial Parkway. If initial plans materialize, this latter parkway will embrace many landmarks associated with the life of George Washington and will afford motorists a continuous boulevard along the Maryland and Virginia shores of the Potomac River.

Another parkway development being carried on by the Service, but one of lesser magnitude than the foregoing, is the Colonial National Parkway linking Yorktown Battlefield, Williamsburg and Jamestown Island. This parkway is included in the Colonial Historical Park, Va. A section following the York River and connecting Yorktown with the outskirts of Williamsburg has been completed and construction of a tunnel under Williamsburg will be initiated in the near future. From that point the parkway route will be along the James River to its terminus at Jamestown Island.

In recent years several other parkway routes have received consideration, among which are a 220-mile Green Mountain Parkway along the flanks of the Green Moun-

Chief Mountain and Chief Mountain International Highway Connecting Glacier National Park, Montana, and Waterton Lakes National Park, Canada.

tain Range and extending from the Massachusetts line to the Canadian border; an Oglethorpe National Trail and Parkway to connect Savannah and Augusta, Ga., its course to follow an old Indian trail through jungle-like river swamps; and a Mississippi River Parkway to extend from the headkwaters of the Mississippi River in Itasca State Park, Minn., to the Gulf of Mexico.

Several of the states cooperating with the National Park Service in a Park, Parkway, and Recreational Area Study[2] have recommended establishment of state parkways. The Indiana and Wisconsin plans recommend parkways along most of the major rivers of the two states, not only to provide pleasant automobile travelways, but also to protect and develop the rivers for the general good. The Missouri plan recommends a system of parkways connecting the important population centers with the parks, forests, and outstanding scenic recreation sections of the state. The Tennessee report suggests extension of the Natchez Trace Parkway north from Nashville into Kentucky. The Oklahoma report recommends a

[2]In 1936 Congress passed the Park Planning Act (Public 770½) which authorized the Secretary of the Interior, through the National Park Service to cooperate with the States and with other Federal agencies in conducting a Nation-wide study of Public Park, Parkway, and Recreational-Area programs, and to formulate plans cooperatively for a national recreational policy.

parkway connecting with the Missouri parkways at the northeast corner of the state and extending south generally following the Niosho and Kiamichi Rivers, and west to the Washita River and Lake Murray. Texas has suggested a parkway along the Gulf coast and extension of the Natchez Trace Parkway west from Natchez, Miss., through Louisiana, and south through eastern Texas to San Antonio and Laredo, where it would connect with the Pan American Highway. The Rhode Island report includes a recommendation for a seashore parkway.

Under the provisions of an interbureau cooperative agreement entered into in 1926, the Public Roads Administration[3] of the Federal Works Agency collaborates with the National Park Service in the location, design and construction of national parkways as well as major roads in and leading to national parks, monuments, and allied areas. Road funds are usually appropriated by the Congress each year and these have been augmented since 1933 by allotments of emergency funds, largely from the Public Works Administration.

Airplane View of One of the Completed Sections of the Cameron-Desert View Approach Road, Grand Canyon National Park, Arizona.

Many of the roads within the national parks, as well as those leading to their gates, are of mountain construction and constitute prodigious feats of engineering.

The Trail Ridge Road in Rocky Mountain National Park, which crosses the Continental Divide in Colorado, is the highest continuous automobile road in America, reaching an elevation of 12,183 feet above sea level. Four miles are located above the 12,000-foot level. Open all year and easily accessible to large centers of population in the East and Middle West, it is one of the most used of western park highways.

The spectacular Going-to-the-Sun Highway in Glacier National Park, Mont., well-known as one of the outstanding scenic roadways of the world, also crosses the Continental Divide. Fifty miles in length, it is the only highway traversing this great alpine wilderness from East to West. One of its outstanding features is a tunnel at an elevation well above 6,000 feet from a great window of which the traveler may obtain glimpses of glacier-clad mountains, alpine lakes, gorgeous wildflower fields, and native wildlife. In constructing this tunnel much of the rock was taken out by hand because it was impossible to get the heavy machinery usually employed for such work in place. This road connects with the Blackfeet Highway which runs north to the Canadian border.

The Zion-Mt. Carmel Highway, a 25-mile link in the road connecting Zion and Bryce Canyon National Parks, Utah, and the North Rim of the Grand Canyon in Arizona, is considered by many authorities to be one of the most outstanding pieces of highway construction ever undertaken. One portion of the road, a mile in length, was built inside a solid cliff. From six galleries broken out through the face of the cliff striking views of southern Utah are afforded motorists.

The Red Lodge-Cooke City approach road to the northeast entrance to Yellowstone National Park, Wyo., from which the traveler can view field after field of alpine flowers and numerous crystal-clear lakes, rises to an altitude of 10,940 feet and forms an access to Yellowstone's Figure-8 Grand Loop Highway of approximately 145 miles.

View East From Tunnel in Yosemite National Park, California.

Seeing America

During the travel season ended September 30, 1939, nearly two million private automobiles were registered at national park gateways. Using an average of 3.5 persons to each car, this means that approximately six and a half million motorists enjoyed the beauties of these areas and motored over the scenic road systems provided therein for their benefit and enjoyment.

International amity was fostered with the construction of the Chief Mountain International Highway—an 11-mile stretch of scenic road connecting the northeastern portion of Glacier National Park, Mont., and Waterton Lakes Park in Canada. These two parks in 1932 were dedicated as the Waterton-Glacier International Peace Park.

If the unsettled conditions in other parts of the world continue to prevail, the travel season just ahead should be, indeed, a record-breaking one, with the Federal Park System and the numerous state parks and allied recreational areas located in every state in the Union attracting many thousands of travelers who might otherwise vacation abroad. Accommodations ranging from housekeeping cabins to hotels are available in the national parks and ample opportunities are provided for recreation, such as hiking, camping, fishing, horseback riding, skiing, tobogganing, and skating.

A colored map, 40x30 inches, on which are indicated the many Recreational Areas in the United States under Federal and state jurisdiction, such as National Parks, National Monuments and allied areas, Indian Reservations, National Forests, Game and Bird Reservations, and the more than thirteen hundred state areas, together with the principal connecting highways, may be had free of charge by writing to the Director, National Park Service, Washington, D. C.

[3]Prior to July 1, 1939, this agency was known as the Bureau of Public Roads, U. S. Department of Agriculture.

[4]Report of the Commission to study the Proposed Highway to Alaska. Department of State, Conference Series No. 14. Washington, U. S. Government Printing Office, 1933.

Traffic on U. S. Route 1, Near Elkridge, Maryland. Abutting Owners Have Crowded Their Buildings Up to the Very Edge of the Already Too Narrow Right-of-Way.

INTERREGIONAL HIGHWAYS

Legal and Right-of-Way Problems

By L. E. BOYKIN
Chief, Division of Highway Laws and Contracts, U. S. Public Roads Administration

WITH the advent of the 20th century the movement for better highways began to develop greater activity and to become more national in scope. I am sure, however, that no one at that time had the slightest expectation that by now our accomplishments in that field could even approximate what they are. Many obstacles had to be met. Administration and control of public highways was vested almost exclusively in local governmental units. Local sources of revenue were relied upon almost entirely for financing all highway work. Drastic legislative changes were necessary in every state.

Legislative changes of such scope usually come about rather slowly. Legislative bodies move in the direction indicated by what their members believe will meet with popular approval. The public must be prepared in advance for any radical departure from established legislative practices. This requires time. It, therefore, was no surprise when the original Federal-Aid Road Act was approved July 11, 1916, that about one-third of the states still had no highway departments at all or else such as they had were so inadequate that additional legislation was required before they could be accepted as qualified to meet the requirements for sharing in this Federal legislation. The constitutions of a few states prohibited their participation in internal improvements, and these inhibitions had to be removed by vote of the people. Further impetus was given to revision of state road laws by enactment of the Federal Highway Act of November 9, 1921. This latter act was an amendment of the original Federal-Aid Road Act, and is the basic statute under which Federal highway aid to the states is now administered.

It was my good fortune to be intimately associated with developments in the highway field during state highway department formation period. This close contact and personal participation in much that transpired gave me a knowledge and understanding of what was accomplished that could not have been acquired in any other way. With this background, I do not hesitate to state that more advanced road legislation was placed in the statute books during that period immediately following enactment of the Federal-Aid Road Act of July 11, 1916, and the Federal Highway Act of November 9, 1921, than during any like period in the history of our country. With the machinery thus established we entered upon an era of road building which has not at any time since abated.

Congested Because Restricted

Our traffic problems, however are by no means entirely solved. In fact, they are about as acute as they ever were, although of a somewhat different nature. The phenomenal increase in the number of motor vehicles and the touring tendency that prevails has flooded the highways with traffic. This has brought the careless and the reckless driver upon the highway, to the hazard of all others as well as himself. Many highways still have sections where danger lurks and congestion grows apace. The annual record of accidents and resulting injury to or death of persons and damage to property casts a pall of fear and disaster which must be dispelled.

Relieving the congestion and removing other causes of danger from those sections of our highways on which hazards are recognized to exist is a job that belongs to the roadbuilder. In fact, it is one of the major problems which must be met by highway officials today. It has its origin primarily in mistakes of the past when highways now of inadequate width were constructed on rights-of-way so narrow that insufficient margin remained for use in widening operations to meet present-day traffic requirements. This is especially true in older sections of the country where the highways occupy rights-of-way that were acquired long ago and the population is densest and property development greatest. Abutting owners have crowded their improvements right up to the very edge of the highway right-of-way and often demand exorbitant prices for any additional land needed for widening the highway. In some instances they even resist all efforts to disturb them in the possession and use that is being made of their property. Cities and towns have made their contribution to this problem by

insisting, often against the wishes of the highway officials, that through highways should be routed through rather than around them. This has resulted in such acute congestion of traffic in many of our cities and towns that the only apparent remedy is to acquire, at great expense, the necessary land to widen such routes through cities and towns or to construct new routes around them, with appropriate spur connections into them. Here again we encounter the same condition of improvements by abutting owners extending to and often encroaching upon the right-of-way line, and the same attitude on the part of such owners of being unwilling to grant the additional land required for widening the highways and streets except at exorbitant prices. In such cases, highway officials have no recourse but to resort to condemnation.

Legal Control

The matter is controlled almost exclusively by the constitutions and laws of the states. There are no Federal statutes on the subject, except those pertaining to the granting of rights-of-way for highways across the public lands and reservations of the United States. There are, however, two provisions in the Constitution of the United States which have a very distinct bearing, one being a limitation upon the Federal government, having no reference to state action, and the other being a limitation upon state action. The provision imposing a limitation upon action which the Federal government might take will be found in the last two clauses of the Fifth Amendment, the pertinent portion of which reads, as follows:

> "No person shall * * * be deprived of life, liberty, or property, without due process of law; nor shall private property be taken for public use, without just compensation."

The provision imposing a limitation upon the states will be found in the due process clause of Section 1 of the Fourteenth Amendment, which clause reads, as follows:

> "nor shall any state deprive any person of life, liberty, or property, without due process of law."

Under specific direction from Congress, the Bureau of Public Roads (now the Public Roads Administration) recently prepared a comprehensive report on the highway problems which confront us. This report was transmitted to the Congress by the President under date of April 27, 1939, and was referred to the roads committees of the Senate and House. It recommended, among other things, the desigation and progressive improvement of a system of reasonably direct inter-regional highways, with appropriate connections through and around cities, and the creation of a Federal Land Authority to facilitate the acquisition of lands needed for rights-of-way. The adoption of these recommendations would involve a change in legislative and administrative policy on the part of the Federal government which can be effected only through Congressional action. The Federal government does not now participate in any way in acquiring rights-of-way and is prohibited by the Federal Highway Act (S. 2) and the Rules and Regulations promulgated for its administration from paying any part of the cost therof or any portion of incidental damages to abutting property. The above-mentioned recommendations, therefore, being before the Congress for its consideration will not be discussed here.

The report referred to above mentions the legal obstacles encountered by highway officials in obtaining essential rights-of-way as one of the major causes of delay in effecting improvements that are needed to make our highways more adequate for the traffic they must carry.

Early Acquisition Difficulties

It is obvious that the acquisition of necessary rights-of-way is a major aspect of this problem. This phase of the problem would not now be so acute if proper foresight had been exercised in acquiring highway rights-of-way in the past and sufficient width had been acquired to allow for future widening which might reasonably have been foreseen. Highway officials, however, are not entirely to blame for this situation. They were limited by the laws under which they had to operate. They were further handicapped by a tendency on the part of the courts in condemnation cases to limit the property which might be taken to the width actually required for the improvements immediately contemplated.

It is believed, therefore, that the difficulties now experienced with respect to the problem of adequate rights-of-way for highway improvements are traceable to three fundamental reasons:

1. The lack of foresight in not having heretofore anticipated future needs more fully;
2. The unduly restrictive provisions in state laws pertaining to highway rights-of-way; and
3. Attitude of the courts.

The suggestion of lack of foresight in the past is not intended in a spirit of criticism. It is merely mentioned as a contributing factor in the present situation. In all fairness, it should be stated that it is not surprising that there was no greater anticipation of future needs than was demonstrated. No one could have foreseen that traffic would increase at the tremendous pace that it did. However, the disastrous nature of the results are in no way mitigated by this fact. This is a mistake of the past, but one which we today should not repeat.

A great deal has been written from time to time concerning the legislation within the several states regarding rights-of-way. In the early days of the Republic, particularly in the thirteen original states, very definite limitations usually were written into the statutes as to the maximum width of right-of-way that might be taken. As other states were organized and admitted to the Union and proceeded to legislate for themselves, they followed rather generally the laws already in force in the older states. A width of four rods was the maximum width which appeared generally in the statutes of the states in the early days and in some states there has been very little change even today. Even in the matter of the Cumberland or Old National Road, which was constructed under authorization of Congress by appropriations spread over the period from 1806 to 1844, the reports indicate that the cleared right-of-way did not exceed four rods.

The Federal government made much more liberal provision for rights-of-way for railroads through the public lands by Section 1 of the Act of March 3, 1875 (18 Stat. 482; U.S.C. Tit. 43, Sec. 934) as follows:

> "The right-of-way through the public lands of the United States is granted to any railroad company duly organized under the laws of any state or territory, except the District of Columbia, or by the Congress of the United States, which shall have filed with the Secretary of the Interior a copy of its articles of incorporation, and due proofs of its organization under the same, to the extent of one hundred feet on each side of the central line of said road; also the right to take, from the public lands adjacent to the line of said road, material, earth, stone, and timber necessary for the construction of said railroad; also ground adjacent to such right-of-way for station buildings, depots, machine shops, side tracks, turnouts, and water stations, not to exceed in amount twenty acres for each station, to the extent of one station for each ten miles of its road."

Workable Authority Lacking

Recently there was received from one of the older states of the Union an inquiry as to whether a certain item of work proposed to be performed along a Federal-aid project would be eligible for Federal aid. This

item of work was intended as a means of paying for the right-of-way for the project. The communication stated that it was impossible for the state to pay any part of the right-of-way cost and that the county in which the work was proposed had no funds and could not provide the right-of-way. On examination of the law applicable in that state, it was found that the controlling statute was a revision enacted in 1914. Under its provisions the highway department is without authority to acquire or to pay any part of the cost of rights-of-way for highways which it constructs. It provides that all costs of acquiring any necessary land for right-of-way and any damage incurred or awarded shall be paid by the county. It permits the highway department to institute condemnation proceedings in the county where the land lies but requires that it shall be represented by the county attorney. The law also provides that the highway department may agree with any landowner as to the value of the right-of-way to be acquired, but that such agreement shall not be binding unless approved by the county attorney and the county court and spread upon the records of the latter. The highway department in this state, therefore, is wholly dependent upon the counties in the matter of procuring and paying for rights-of-way for highways, and when a county fails or refuses to act the state is powerless to act. It is understood that under the rulings in effect in the state a county cannot be compelled by mandamus against its officers to procure and furnish necessary rights-of-way for the state.

There are other states which do not empower the highway departments to acquire rights-of-way, but provide that they shall be acquired by the counties. In all such states the highway departments operate under a definite handicap, and their laws should be so amended as to eliminate this handicap and authorize the highway departments themselves to proceed with the acquisition of all rights-of-way for state highways.

The highway department of a majority of the states are also handicapped by the fact that under their state laws they can not obtain possession of rights-of-way secured through condemnation until completion of the condemnation proceedings and payment of the compensation awarded the owner. Many meritorious projects have been delayed and in instances their improvement defeated because of the inability of the highway departments to obtain prompt possession of the necessary lands on which to construct them.

Legal Provisions Adopted

There is at this time a more pronounced movement on the part of states than at any previous time to secure necessary revisions in the legislation which controls the acquisition of highway rights-of-way. A few states have done much to correct this situation within the last few years. Some of them not only have vested complete authority in their highway department to acquire necessary rights-of-way, but also have authorized immediate possession in cases of condemnation in advance of the termination and payment of compensation to which the owner is entitled. North Carolina has a law on this subject which operates in a very satisfactory manner and has been upheld by the courts of the state in a number of instances. A few other states already have legislation along this line.

There was ratified at the polls in 1916 an amendment (Article 17) to the Constitution of Rhode Island which apparently has met in a very satisfactory manner the situation with respect to acquiring ample lands for highway right-of-way purposes within that state. The language of this amendment is such that it is believed it may be helpful to quote it here in full, as follows:

> "The general assembly may authorize the acquiring or taking in fee by the state, or by any cities or towns, of more land and property than is needed for actual construction in the establishing, laying out, widening, extending or relocating of public highways, streets, places, parks or parkways: Provided, however, that the additional land and property so authorized to be acquired or taken shall be no more in extent than would be sufficient to form suitable building sites abutting on such public highway, street, place, park or parkway. After so much of the land and property has been appropriated for such public highway, street, place, park or parkway as is needed therefor, the remainder may be held and improved for any public purpose or purposes, or may be sold or leased for value with or without suitable restrictions, and in case of any such sale or lease, the person or persons from whom such remainder was taken shall have the first right to purchase or lease the same upon such terms as the state or city or town is willing to sell or lease the same."

A law was enacted in Rhode Island in 1937 (ch. 2537) providing for the construction, maintenance, and improvement of freeways. This act defined a freeway to be "a way especially designed for through traffic over which abutters have no easement or right of light, air, or access by reason of the fact that their property abuts upon such way. Eight other states have somewhat similar legislation, although not as definite and comprehensive in all of them as that in Rhode Island.

It is essential also to have a proper measure of control over developments adjacent to highway rights-of-way. In cities this can be approached best through building codes and zoning laws and regulations. Outside of cities zoning laws and regulations and agreements that may be obtained with the landowners will have to be relied upon generally, but there are areas in some sections of which building codes also may apply. This is exceedingly important in order to be able to protect the roadsides from unsightly developments, prevent encroachments, and insure greater safety for traffic.

Suggested Revisions

In order to meet the situation thus outlined as due to existing legislation in so many of the states, those states which have not already done so should revise their existing laws along the following lines:

1. To vest authority in the highway department to acquire rights-of-way for all highways constructed under its jurisdiction.
2. To vest authority in the highway department to fix and determine the width of rights-of-way to be acquired, and any maximum limit on the width of rights-of-way which might be acquired should be eliminated.
3. To empower the highway department to take possession of lands to be condemned in advance of completion of the condemnation procedure.
4. To provide for a system of zoning to apply along state highways to protect bordering land from exploitation and to safeguard the highway against encroachment by advertising signs, buildings, business, or other developments.

Function of Courts

It is quite popular to refer to the attitude of the courts and blame them for many of the delays and hampering restrictions encountered by highway officials in their efforts to obtain necessary rights-of-way. These difficulties are confined to cases where highway officials are unable to reach an agreement with landowners and have to resort to condemnation. The right of condemnation arises by virtue of the power of eminent domain which is inherent in governments. It is an attribute of sovereignty and was often notoriously abused by sovereigns of by-gone years.

The courts have manifested a certain zeal for the protection of the property owner against attempts at expro-

priation of his private property under the guise of its being for a public use when in fact the proposed taking is in excess of what is required for such use. Undoubtedly, the attitude of the courts extends back to and finds its roots in the early history of the exercise of the right of eminent domain and the disregard of the rights of the private owners by some elements of government. It must be remembered that not many centuries have elapsed since courts first began to be established with power and authority to throw a protective mantle around the private individual. During colonial days it was permissible in the American Colonies to confine a person in prison for debt. Recently at Williamsburg, Virginia, I was shown through the old jail which was in use at the time of the Revolutionary War. Particular attention was called to the cells in which the debtor prisoners were confined.

Courts are not emotional institutions. They are supposed to be immune to bias, emotion, or other influences and to administer even-handed justice, without fear or favor. They may not change as rapidly in their views and attitude toward some questions as might be desired by those who are dealing with such questions more or less exclusively and become enthusiastically imbued with the idea of and need for certain reforms. They are different from legislative bodies. But even legislatures have not, any more than have the courts, kept pace with the need for change in the laws respecting the acquisition of rights-of-way for highway purposes.

Right-of-way matters usually reach the courts on the question of whether a proposed taking is for a public use. The question of suitable or adequate compensation is not often involved, since the procedure prescribed for condemnation embodies all necessary machinery for ascertaining the compensation to be made. Recitals frequiently are incorporated in legislation by legislative bodies declaring the uses to which it relates to be public uses. Courts of last resort, both state and Federal, have repeatedly held that the question of what constitutes a public use is a judicial one, and that while legislative declarations on the subject are persuasive and will be given consideration they are not controlling.

Justify Land Taking

It seems clear to me that many of the difficulties charged to the courts may be overcome by more careful planning of improvements and by not attempting to take more land for a particular improvement than can be justified. When a landowner contests a proposed taking the officials in charge of the improvement and proposing to exercise the right to take the property involved should realize that they must be prepared to justify the taking as reasonably necessary for the contemplated improvement. That does not mean the absolute minimum that will accommodate the improvement to be undertaken at the time, but so much additional as may be demonstrated will be needed within a reasonable time, including in some jurisdictions at the present time what may be needed for roadside development and roadside protection. There are cases of record where the courts have given their approval to acquisition of more land than was needed for the immediate use of the highway, the additional acquisition being for future expansion of the highway improvement, for roadside development and protection, and for preservation of the aesthetic values along the highway.

I am convinced that a great many cases in which the proposed taking was denied were lost before they ever reached the courts. In fact, I am sure that many of them are doomed before they even reach the attorneys who have to handle them in the courts. It seems to me that there should be a better coordination of the efforts of the engineering officials having charge of the planning, design, and execution of road and street improvments with their legal advisers before they get themselves involved in a situation in which they face certain defeat if they get into court. A noticeable fact in connection with condemnation cases is the usual vague, indefinite, and unconvincing evidence of the witnesses for the public agency involved as to the actual need for all of the land proposed to be taken.

Roadside Development of Connecticut's Merritt Parkway Protected by Adequate Right-of-Way Control.

Example Cited

It is not possible in an article of this scope to present quotations from decisions to illustrate a point. However, there is one which demonstrates the points mentioned above.

In the case of the City of East Cleveland v. Nau, et al., the Supreme Court of Ohio held adversely to the proposed taking in excess of what was needed for the improvement. The case involved a grade separation project, and the issues involved are succinctly stated by the court in its decision in the following language:

"The principal issue presented in these cases is this: Were all of such excess lands needed in the furtherance of this improvement or was their attempted appropriation arbitrary and needless? Upon that issue, both of the lower courts found that the appropriation of the larger portion of the excess lands was not necessary for lateral support for the improvement, and was not in furtherance of the public use. The lots of the several defendants in error, facing the improvement, were 130 feet in depth and incumbered by buildings. All of this property was sought to be taken for a proposed grade extending from the sidewalk, to be 'graded on a slope which rises three-eighths of one inch per foot of horizontal distance from the grade of said sidewalk,' etc. The grade so established by the city, taking substantially the whole of the properties of the several defendants in error, was wholly unreasonable and unnecessary for the maintenance of the street, or for its lateral support. The arbitrary fixing of a three-eighths of an inch grade therefore was unreasonable. This is evidenced by the testimony of one of the engineers introduced by the city, who in answer to the court's query, testified, in effect, that not more than 10 feet or 20 feet from the sidewalk would be necessary for grade maintenance. That testimony is as follows:

"The Court: The only purpose they have beyond the twenty-foot line would be sort of a park purpose?

"The Witness: Something of that kind. That has been discussed a number of times.

"The Court: It might extend ten feet—after you take enough land to make the hundred foot street, it might be considered merely for park purposes beyond ten feet. It wouldn't be necessary to slope it down?

"The Witness: I don't know whether you could call that park purposes or not, but as a general part of the improvement.

"The Court: It wouldn't be necessary though in construction of that road, actually necessary beyond the ten feet line?

"The Witness: No."

The Economic Aspects of INTERREGIONAL HIGHWAYS

By HENRY F. CABELL
President of the American Association of State Highway Officials

THE subject implies a very learned and erudite discussion of the basic principles of highway economics. It has lately been customary for highbrow economists to draw integral signs all over their papers to illustrate profound economic truths. As Chairman of the Oregon State Highway Commission, I am not an engineer and, therefore, must approach the subject in a much simpler manner.

Twenty-five years ago, when highway construction in this country virtually began, there was such a strong demand for smooth surfaces upon which to operate the newfangled "gasoline buggy" that little attention was given to any principle of economics in the selection of roads for improvement. Starting at scratch, so to speak, the race between the building of motor vehicles and the building of roads began. Only in recent years has there been any indication that it might be possible for the roads to catch up with the vehicles. Before that time they did not even keep pace with them.

Fact-finding studies by the so-called Planning Surveys initiated by the Public Roads Administration and carried out jointly by this agency and the several states indicate quite clearly the necessity for the improvement of certain main highways of the nation connecting important centers of population. These studies brought out not only the need of modernizing rural highways, but the paramount importance of the reconstruction of the routes of highway arterials into and through the cities. At the beginning of the race to which I have referred, the city streets were far in advance of the motor vehicles, but twenty-five years afterward a far different picture is found. In many cities the rural highways lead into narrow, congested streets which cause a hazard in operation and, in view of the great number of units involved, a material financial loss in time and in fuel consumption.

The report of Thos. H. MacDonald, Commissioner of the Public Roads Administration, clearly points out the need for the building of a free interregional highway system in accordance with the best modern design. Personally I thoroughly agree with his diagnosis and am opposed to the toll plan of building such roads. The gasoline tax is an easy, convenient, and inexpensive way of metering the use of highways for passenger vehicles. When supplemented by the ton-mile tax, the same is true of heavier vehicles. The expense of toll collection, nationwide in scope, would be enormous. However, of far more importance, the expenditure of the vast sum for building toll highways in such manner and in accordance with such design as to attract vehicles from toll-free roads would not be warranted in view of the benefits created. Mr. MacDonald found that, in the case of the toll roads proposed, only forty per cent of their cost could be amortized by toll charges.

It is my opinion that there is a need for the reconstruction of the heavy-traffic rural and urban arterials throughout this nation and that the annual benefits created would be far in excess of the annual amortization charge for the better facilities provided.

Benefits Should Exceed Cost

In general the proposed interregional highways were the first highways constructed in the nation. In view of the rather meager knowledge of highway economics of that day and the lack of almost any concept of the improvement in motor-vehicle design, practically all of these first highways are now obsolete. Many of them have been improved to better standards, but in the main, they fall far short of providing the service which is necessary to carry on the nation's trade and commerce with economy and dispatch. In general these roads are the road earners; in other words, the fees and taxes collected from the users of these roads have provided the funds not only to build and maintain the roads in question, but also to extend the system. It is certain that, in fairness and justice, these roads should be improved in such manner as to produce maximum benefits to the users.

In choosing a system of interregional highways, extreme care should be exercised. The designations should be made upon the basic principles of highway economics without fear or favor of factions or groups. The mileage should not be large and only the more important roads should be chosen, particularly for the initial system.

In all cases the design should be based upon standards measured by the economic yardsticks. In other words, such roads must produce benefits in excess of their cost and the system must be solvent; i.e., the annual cost of the facilities provided must be paid from the annual contributions of the beneficiaries. Otherwise bankruptcy will result.

In general, such roads should be freeways with limited access, as otherwise the ribbon development which rapidly follows the opening of new highways will curtail the benefits and restrict the use. Such roads should be designed in a manner permitting a reasonably high speed with safety. On sections that have already been built, wherein widening and minor straightening are required to obtain proper design, wide rights of way should be provided where possible, service roads for abutting property should be constructed, and the spread of ribbon development checked.

Preserve Local Autonomy

Now, with regard to the Federal participation in the construction and maintenance of interregional highways, I am perhaps somewhat old-fashioned, but I am thoroughly in accord with the view that in order to preserve the principles of democracy we must preserve local autonomy. I feel certain that the continued increase of centralized authority in the Federal government is inimical to the well-being of the peculiarly successful economy developed in this country during the past one hundred

years. People must meet their own obligations to preserve those virile qualities of self-reliance and independence which are the birthright of freemen. There is a decided difference between Federal aid to the states and complete Federal control.

I am thoroughly in accord with the Federal-aid principle of highway construction and the supervision by that central authority now known as the Public Roads Administration. Without some such control, it would be impossible to reconcile the many differences between states in the location of interstate highways. Moreover, the coordination in the setting up of basic principles of design and construction by a central authority has proven of great benefit in the development of a national system of highways.

Interregional highways are important not only to the individual states, but also to the nation at large. They are far more important to the nation than the average road on the present Federal-aid highway system. It would, therefore, seem that in equity and justice the Federal government should increase its contribution from 50 per cent to 75 per cent of the cost of construction of such roads, the states assuming the maintenance and operation. This would make in the end an approximate 50-50 break, which, in my opinion, is an approximately fair division of the responsibilities involved.

Army Mobility

There is another aspect to the building of adequate interregional highways which we should not minimize. Far-reaching changes in the political groupings of peoples are now in the making. Fanatic preachers of subversive ideologies have gained the ascendency in many lands. The rule of force is paramount. Reason and justice are temporarily in the discard. When reason does not prevail, we should take heed. Recent events have indicated the effectiveness of rapidly-moving mechanized armies. We are a continental nation, large in area, and wedded to the democratic principle of a small peace-time army. That army to be effective must be a mobile one, and we must have adequate highway facilities, interregional in character, upon which to move it.

The day has passed when a peace-time nation can beat its plowshares into swords rapidly enough to repel an invasion. Modern armaments must be provided long beforehand. Likewise the time has passed when we can rapidly throw up a rough road over which to move a modern army. Adequate roads and bridges take time to build. We must provide them long before their actual need for defense purposes arises.

Improve Domestic Economy

Throughout the ages, wealth has been created through trade and commerce. Transportation facilities create wealth from potential resources. The internal combustion motor has revolutionized transportation. Highways touch upon the lives, either directly or indirectly, of all our people. We face the stern realities of severe competition between the nations of the earth. We desire to manufacture and produce commodities for our own domestic market and the world's trade. We must make the needed improvements in our highway transportation facilities if we are to meet world-wide competition and preserve our present standards of living for the coming generations in this country.

The economic aspects of interregional highways present a challenge to the Federal and state highway authorities of this country. Highways are intricately interwoven in the trade and commerce of the nation. The well-being of all people in this country is dependent upon the correct solution of this problem. As a nation we must continue to eliminate waste. One of the great costs of the production and distribution of goods is that of transportation. The great bulk of the nation's commodities is carried over the present interregional highway system. The improvement of the rural and urban interregional highways will create astounding benefits through the savings in time and operating cost in the movement of motor vehicles. We must ever be a forward people, if we are to hold our place in the sun.

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OVER $1,750,000,000 COLLECTED FROM THE MOTORIST

More than a billion and three-quarter dollars ($1,781,095,000) was collected in taxes on the ownership and operation of motor vehicles in 1938. Of this sum nearly a billion and a quarter ($1,217,344,000) was in special state and local taxes, levied expressly for highway purposes. The balance of $563,751,000 was a direct contribution in support of the general government. These are figures released by National Highway Users Conference in its 1940 edition of "Registration Fees and Special Taxes for Motor Vehicles."

This publication, covering every state in the Union, lists all special state and local taxes and fees on motor vehicle owners for use of the highways. The study clearly indicates that motorist-taxation has no universal formula. Collection methods vary widely—more than a score of different bases being used to compute registration fees; with about as many tax combinations as there are states. State gasoline tax rates, for example, vary from two cents to seven.

Diversion of highway funds continued in 1938 to the staggering sum of $157,516,000—that amount being taken from highway tax receipts and used for other governmental purposes. And while New York led the states in highway income, she also headed the list in "diversion" of highway funds. Pennsylvania was second in diversion followed by Ohio, California, New Jersey, Texas and Illinois.

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ASSOCIATED EQUIPMENT DISTRIBUTORS TO MEET JAN. 26 AND 27

The annual meeting of the A.E.D. will be held Jan. 26th and 27th, at the Stevens Hotel in Chicago.

On Friday, Jan. 26th, there will be sessions for members only, during which the program committee has arranged discussions on very important subjects, such as: Cost of Distribution, Sales and Rental Contracts, Local Groups, and Rentals. A good representation from the 300 A.E.D. members has been indicated, making certain a lively discussion of the above topics. Other topics of an important nature are expected to be introduced.

A stag dinner has been arranged to follow the Friday sessions.

Beginning with a luncheon, Saturday, Jan. 27th, the equipment manufacturers will meet jointly with the Distributors and prominent speakers will be heard on vital subjects that affect the industry as a whole.

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Highway Engineering Conference at Cleveland—The second annual regional conference on highway engineering will be held Jan. 25-26 at Case School of Applied Science, Cleveland, O. Prof. M. S. Douglas is in charge.

Scarifying Village Street for Tar Base Stabilization

REVIEW OF ROAD TAR USES IN 1939

By GEO. E. MARTIN

Consulting Engineer,
General Tarvia Department, The Barrett Co.

WHILE some road tar is furnished under the trade names of the various tar refiners, the major portion is manufactured to meet the technical specifications of national and state purchasers of road tars. While these specifications vary in minor details, the grades and consistencies given herein are being quite generally adopted. These standard designations are as follows:

Grade	Consistency	
RT- 1	Specific Viscosity, Engler, at 40° C	5- 8
RT- 2	Specific Viscosity, Engler, at 40° C	8- 13
RT- 3	Specific Viscosity, Engler, at 40° C	13- 22
RT- 4	Specific Viscosity, Engler, at 40° C	22- 35
RT- 5	Specific Viscosity, Engler, at 50° C	16- 26
RT- 6	Specific Viscosity, Engler, at 50° C	26- 40
RT- 7	Float Test at 32° C., seconds	50- 80
RT- 8	Float Test at 32° C., seconds	80-120
RT- 9	Float Test at 32° C., seconds	120-200
RT- 10	Float Test at 50° C., seconds	75-100
RT- 11	Float Test at 50° C., seconds	100-150
RT- 12	Float Test at 50° C., seconds	150-220
RTCB-5	Specific Viscosity, Engler, at 50° C	17- 26
RTCB-6	Specific Viscosity, Engler, at 50° C	26- 40

Both coal tars and water gas tars have been used for the production of road tars. For several years separate specifications were used for coal tars and water gas tars, but it is quite common practice now to use one combined specification for the two materials.

Skid Resistance

Many highways built some time ago have become slick and smooth under traffic. Roads of this sort are exceedingly dangerous in wet weather. In some instances excessive crown has increased the difficulty. A fairly large mileage of such roads has been surfaced with tar in 1939 to improve the resistance to skidding. The method has been to surface treat the slippery road with a hot surface treatment tar, covered with aggregate rolled in place.

The amount of tar used has varied from ¼ to ⅓ gal. per square yard depending upon the condition of the original surface and the kind and amount of traffic carried by the road. A tight, close surface required the smaller amount of tar, and an open surface which would absorb some of the tar was treated with the larger amount.

The grade of tar to be used depended on the section of the country where the road was located and the traffic to be accommodated. Grades RT-8 to RT-11 have been successfully used. In general the heavier tars have been used in the south and the lighter ones in the north.

Covering material has usually been crushed stone or slag, although some gravel has been used. The amount of covering material varied with the condition of the original surface and the amount of tar used in the surface treatment. From 20 to 30 lb. per square yard have been used. The most commonly used size of cover has been No. 8 of Simplified Practice Recommendation R163-39 ranging in size from ⅜ in. to No. 8 sieve. Somewhat coarser sizes have been used in some cases.

Covering operations followed very closely behind the application of the hot tar. The covering aggregate was swept to insure uniform distribution and then rolled in

Distributing Tar in Tar Base Stabilization

place. Both a rubber tire roller and a flat wheel roller were used. Rolling was continued for a few days with the road under traffic so as to thoroughly imbed the aggregate into the tar. Excess loose cover was swept up and removed from the road. This is a very necessary procedure since the loose aggregate acts as an abrasive under traffic and causes unnecessary wear on the surface treatment.

Tar Base Stabilization

The general use of tar for base stabilization has continued and increased during the year. By the use of this method, many road organizations have been able to conserve their supply of local aggregate and provide adequate bases at low cost.

There are many miles of gravel and traffic-bound macadam roads in various parts of the country which are not strong enough to support the traffic coming upon them. Usually these roads have a thin crust of aggregate not over 3 ins. thick. They hold up fairly well under light traffic but are dusty, dirty, and generally unsatisfactory. When roads of this sort are treated with bituminous material and sealed so that the water cannot get out through the surface, they almost always break up seriously in the spring.

One remedy, of course, would be to add aggregate to the road and strengthen it by increasing the thickness. This is sometimes expensive and often difficult to accomplish in a satisfactory manner.

Tar Base Estabilized Street in Borough of Northeast, Pa.

Mixing the existing aggregate with a part of the underlying sub-grade and waterproofing the mixture has been a satisfactory and economical solution of the problem.

The process as carried on in a number of localities in 1939 involved the plowing of the existing road to a depth of about 6 ins. The aggregate and soil were then thoroughly mixed together.

The grade of tar used varied from RT-3 to RT-5. Since the loosened material contained a fairly large percentage of aggregate, only a comparatively small amount of tar was required for the stabilization. This usually ran about 1 gal. per square yard or slightly less.

If the road was very dry, water was added to assist in the mixing and to insure adequate consolidation. Only sufficient water was added to produce a damp mix and not a wet one.

The tar was distributed over the surface and was thoroughly mixed with the soil and aggregate by means of harrows, maintainers, or blade graders. Sometimes two or more kinds of mixing machines were used on the same job. Traveling plant mixers were used on a few projects.

Consolidation was usually started with the sheep's-foot roller. On some jobs the high percentage of large sized aggregate present prevented the efficient use of the sheep's-foot roller. Rubber tired rolling was almost always a part of the consolidation procedure. This may have been accomplished by the use of a rubber tired roller or by the operation of rubber tired road machinery or trucks over the road surface. The final consolidation was generally accomplished by means of a flat wheel steel tired roller.

A tack coat of the same grade of tar used in the mix was applied soon after the final rolling. About ¼ gal. of tar per square yard was used for the tack coat.

Traffic was usually admitted as soon as the tack coat was applied. However, the job to this point was considered only a base, and a weather and traffic-resisting wearing course had to be added before the road was complete. In many cases this work was delayed for several weeks after the completion of the tar-stabilized base.

Mixing in Tar Base Stabilization

The surface course was usually a hot tar surface treatment covered with gravel or crushed stone or crushed slag. As traffic increases, the road can be strengthened by the addition of a tar-bound retread or similar wearing course of appreciable thickness.

One Indiana county alone improved over 25 miles of thin gravel roads by stabilizing them with tar in 1939.

Tar Shoulders

One of the expensive and difficult maintenance operations is the care of the edge of pavements bordered by the ordinary earth or loose aggregate shoulder. Unless the shoulder material is constantly dragged up to the

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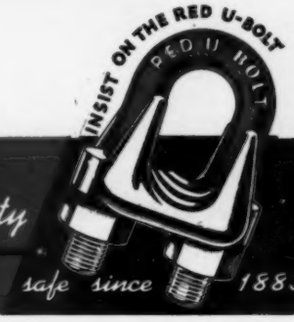

Rolling with Sheepsfoot Roller in Tar Base Stabilization

edge, a rut is formed which is exceedingly dangerous to traffic.

When sufficient aggregate is present in the shoulder it may be treated with tar and bound in place. The state highway department of Connecticut has done this, using light applications of RT-3 tar. These applications have been from ⅛ to ¼ gal. per square yard, covered with sand. The shoulder was dragged with a sled drag. Successive applications of tar and sand with dragging from time to time has produced satisfactory shoulders which are always even with the pavement.

Where sufficient aggregate for the surface treatment was not present or easily obtainable, the earth shoulders have been stabilized by the use of tar.

The first operation was to plow the earth shoulders to a depth of 5 or 6 ins. and a width of 4 ft. and to pulverize the soil by means of disc harrows. If the soil was very dry, it was sprinkled to produce a damp mix.

Rolling with Flatfoot Roller in Tar Base Stabilization

Tars of the grades RT-3 to RT-5 have been used. The tar was applied to the soil at the rate of about 1½ gals. per square yard.

In order to facilitate mixing, the tar-treated soil was moved up onto the pavement and mixed there. After thorough mixing, the tar-soil mixture was placed back into the shoulder trench and consolidated with the sheep's-foot roller. The final consolidation was with truck wheels and a flat wheel roller. A tar tack coat of about ¼ gal. of tar per square yard was applied. The shoulder was finished by the construction of a bituminous wearing course.

Residence Streets

In these days of reduced budgets and tax-conscious property holders, expensive street pavements are not very popular. In spite of that, there is still a demand for improved streets with the provision that they must not cost too much money.

Tars have been used extensively to treat well-built, solid, plain gravel and macadam streets with successful results for many years. Many gravel and stone streets, however, do not have a sufficent depth of aggregate to provide the necessary support underneath a surface treatment.

Mixing for Tar Stabilized Shoulders

Several cities and towns in 1939 have used tar base stabilization to prepare streets for tar surface treatments at low cost.

The methods used are the same as those described under Tar Base Stabilization in this article. The results have been just as successful as those obtained by the use of the method on country roads.

Conclusion

Tars have been used in all of the conventional methods of road construction and maintenance in 1939. In addition, distinct advances have been in the field of tar base stabilization, both for country roads and town and city residence streets. Tars have been used also in the construction of many miles of improved shoulders along highway pavements, thus increasing the safety of the motoring public. Tar skid-resistant surfaces have also added to the safety of the traveling public by reducing the hazards of skidding.

Howard Street Extension, Baltimore, Md. A 6-Lane Brick Paved Express Artery in Which Brick of Contrasting Colors Were Used as Permanent Markers. Completed in 1939.

BRICK PAVEMENTS

Past, Present and Future

By G. F. SCHLESINGER

Engineer-Director
National Paving Brick Association, Washington, D. C.

Editor's Note

The very day that we received this article from Mr. Schlesinger we received a telegram of the untimely death of our true, honored, and respected friend. Whenever it came to pass that George could add his bit to the advancement of engineering science he could be depended upon to do it honestly and fairly. Engineering lost a balance wheel when George passed on.

NABOPOLASSAR, King of Babylon, is believed to be the first city official to use brick with asphalt filler for street paving. Nebuchadnezzar, his son, continued the practice with the usual pronounced success if we are to judge from an inscription he placed on a brick recently dug out of the ruins of this ancient city. The inscription has been translated as follows:

"The streets of Babylon, the procession Street of Nabu and Marduk, my lords, which Nabopolassar, King of Babylon, the father who begot me, has made a road glistening with asphalt and burnt brick; I, the wise suppliant who fears their lordships, placed above the bitumen and burnt bricks, a mighty superstructure of shining dust, made them strong within with bitumen and burnt bricks as a high-lying road. Nabu and Marduk, when you traverse these streets in joy, may benefits for

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Left: **Rotary Broom:** Steel wire; power driven, measure 8 ft. long x 26 in. in diameter. Broom pressure on pavement, direction of sweeping, etc., controlled hydraulically from cab.

Left: **Rear Roller:** Built in removable sections, for operation as a 4 or 6-ft. roller with lineal inch pressure of 268 and 185 pounds; measures 30 in. in diameter; operates hydraulically.

Right: **Oval Scarifier:** Cuts 46 in. swath. Has eleven tines whose V-formation provides easier penetration, lighter draft and better disintegration. Other scarifiers available.

Below at Right: **Rear and Front Disc Harrows:** Cutting width about 6 ft. Use 20-in. heat-treated steel discs; 2 in., 4 in. or 8 in. spacings. Operate hydraulically; are rigid when working. Discs can be angled to suit work.

Below at Left: **Snow Plow:** Uses the superpower and traction of 4-wheel drive and steer to remove deeper snow at higher speed.

Below: **Bulldozer:** Extremely simple, strong and easy to mount in place or detach. Operates hydraulically.

me rest upon your lips; life or distant days, and well-being for the body. Before you I will advance upon them. May I attain eternal age."

Nebuchadnezzar's wish for the attainment of "eternal age" may or may not have been granted, but one thing is reasonably certain—the bricks that he laid on the procession streets of Nabu and Marduk outlasted him so far as life on this earth is concerned. The Chaldean King of Babylon was 43 when he died, and paving brick usually haven't begun to catch their "children's diseases" at so early an age. It is a far cry from the slave-made, sun-burned brick of Babylonian days to the modern vitrified paving brick. It was not until after about 1880 that cities and counties in the United States began to pave to any extent, while the last 30 years has witnessed the really enormous increase in motorized traffic with the corresponding growth in street and road surfacing.

Wherever vitrified brick have been used for paving, brick pavements have an enviable record of performance. There are brick roads in Holland doing service today that were built more than 100 years ago. A quotation from Griffis in his book on "Brave Little Holland and What She Has Taught Us," is as follows: "After the Romans left and the barbarians triumphed, brick

This Brick Pavement in Holland Has Given More Than 100 *Years of Service.*

making became one of the lost arts. In the Rhine Delta, the Dutch revived the art of molding clay into oblong forms and baking them into stone. They made brick houses, walls, pavements and road beds. So hard are the Dutch bricks burned that the common name is 'Klinker.' Many of them have defied the teeth of time for ages." The article concludes:

"Some of the brick roads are 200 years old. This type of road in Holland was begun in sandy-soil districts, where traffic on the natural soil was otherwise impossible. A large number of these roads built during Napoleon's time are still in existence and in good condition."

In U. S. A.

In America, there was practically no paving in even the larger cities until after 1865. The first brick paving was laid in Charleston, W. Va., in 1871, and gave satisfactory service for 38 years. Incidentally this distinction is disputed by Bloomington, Illinois, which has recently offered proof that it built a brick pavement the previous year. The service given by brick pavements 30 or more years old in practically every city in the United States has been truly remarkable. It is unnecessary to refer to the unparalleled change in the volume and character of highway traffic since these old brick pavements were laid. When the early brick pavements were constructed the individual units used in the pavement were inferior, judged by present-day standards. Frequently these brick pavements were laid on natural soil without base or adequate drainage. Nevertheless they can boast of a remarkable record of performance. In the Federal program of work relief renewed attention has been directed to the excellent results that can be obtained by reclaiming and relaying on reconstructed or new bases old brick pavements that have been in service for years. Many of these relaid surface approach a new brick pavement in appearance and characteristics and are a tribute to the unique durability and salvage value of paving brick.

First Brick Road

A journey around the "Roads of the World," located at the Ford Rotunda grounds in Dearborn, Michigan, begins and ends with an attractive skid-proof vitrified brick pavement. Opened to the public in July, 1937, eighteen sections, modeled after historical roads in all parts of the world, have been an object of intense in-

East Main Street, Battle Creek, Michigan. Old Brick in Pavement, Originally Laid in 1901, *Were Reclaimed and Relaid on Reconstructed Base as WPA Project in* 1938.

terest to multitudes of visitors who have motored over the half mile journey.

In connection with the brick pavement on this famous exhibit, the question arose as to where and when the first brick road—not a city street—was constructed. What are believed to be undoubtedly the true facts were developed by Mr. A. C. Rose, Senior Highway Engineer of the U. S. Public Roads Administration, who is an authority on the history of highways in America. An investigation revealed that in Bulletin No. 17 published by the "Office of Road Inquiry," U. S. Department of Agriculture in 1895, there was an article on "Road Building in Ohio, by Hon. Martin Dodge, President, Ohio State Highway Commission." Further inquiry brought the information that President William McKinley, in his first message as Governor of Ohio, to the General Assembly in January, 1892, called attention to the necessity for better roads and advocated the appointment of a commission to report to the Governor on several things among which were "what the average cost per ton per mile now is on horsepower, and what

the approximate cost would be if artificial power should be substituted for horsepower, and especially whether it is possible and advisable to construct country roads so that both cars and wagons can pass over the same road propelled either by horsepower or artificial power." At that time the interurban electric line, that has now practically yielded to motorized highway traffic, was making its bid for attention.

The Chairman of the Commission appointed on March 24, 1893, as a result of the legislature's favorable response to the governor's recommendation, was Mr. Martin Dodge of Cleveland, who was the author of the article previously referred to. In this article there is a description of the design and construction of a brick pavement in 1895 on the "Wooster Pike," Cuyahoga County, about 10 miles southwest of the public square in Cleveland, in what was then a strictly rural locality but is now in the suburban municipality of Parma Heights. This first road with brick on a rolled stone base was in service for over 30 years when it was replaced with a 40-foot modern brick pavement. The route has been designated as U. S. 42, the main state and Federal highway connecting Cincinnati and Cleveland, the principal cities of the state.

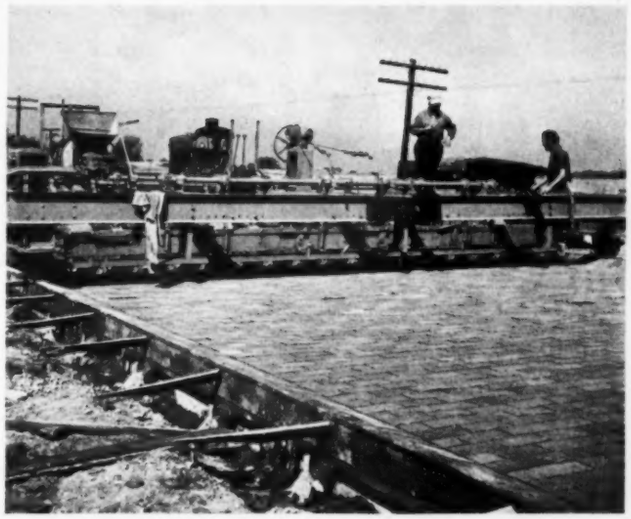
Present Practice

The modern brick pavement structure of the cushion type consists essentially of the following component parts: The Surface Course is composed of rectangular-shaped vitrified clay units assembled in regular pattern with the joints or interstices completely filled and sealed, binding the unit together. The Bed or cushion course is a thin layer of granular material on which the paving brick units are laid and imbedded and which will permit slight adjustments because of irregularities in the foundation or permissible variations in the depth of the brick. The Base Course or foundation supports the bed and surface and distributes traffic loads to the subgrade.

The character of present-day high speed motor traffic and recognition of the fact that highway plans in the future will provide for even greater speeds have created the demand that the wearing surface of the modern brick pavement should be smooth and anti-skid in character. These results have been attained principally by the following developments of the last decade: the vertical fiber side and end lug paving brick unit with its wire-cut skid-resistant traffic surface; the surface-removal method of filler application resulting in a clean exposure of the wire-cut surface; the low-exuding types of fillers insuring the retention of original skid-resistant character of surface; bituminous mastic bed material; and rigid requirements for smoothness both in base and top course. Rolling on boards, a recent innovation in rolling the brick before filling, has a number of points in its favor. Reinforced brick pavement has received consideration in an experimental way. The National Paving Brick Association maintains a Research Bureau at the Ohio State University Experiment Station under the general supervision of Dr. G. A. Bole with H. Z. Schofield in direct charge. In the scope of its program it endeavors to contribute information of value in the improved utilization of paving brick as well as in production practices.

Vibrated Monolithic

A development, more recent than those mentioned previously, that has made a universally favorable impression on highway engineers familiar with it, is the modern vibrated monolithic type of brick pavement. There has now been sufficient experience with its construction and use that it is certain to receive recognition as an achievement in pavement design of great importance. The brick



Vibrating Machine Tamping Brick in Construction of Vibrated Monolithic Brick Pavement on Route U. S. 30 (The Lincoln Highway) East of Canton, O., Completed December, 1939.

without cushion or curbs are laid directly on the green concrete base, imbedded with a mechanical vibrating machine and filled with grout. The brick vibrating machine traveling on the side forms has closely spaced metal straight edge tampers resting on the brick surface, 12 in. wide and 6 ft. long, actuated by electric vibrators mounted on a beam vibrating at the rate of 3,600 impulses per minute. As indicative of design practice the latest vibrated monolithic brick pavement completed late in 1939 on U. S. 30 just east of Canton, Ohio, as a federal-aid project had 1 in. load transferring expansion joints at 120 ft. intervals with doweled longitudinal joints. The width for most of its 2.135 miles was 22 ft. and lip curbs were formed by wedge shaped brick at the edges.

The first monolihtic pavement in which the brick surface was laid on the green concrete—but not vibrated—was constructed in March, 1915, in Edgar County, Illinois, four miles east of Paris, the county seat. Mr. Alan J. Parrish, now located in Paris and engaged in manufacturing, who constructed this pavement, was granted a patent on the method, now expired. He reports this year that the "original piece is in wonderful condition."

In 1933 the Ohio Highway Department constructed a brick pavement experimental project known as the Carroll County Experimental Brick Road which has been

Closeup View of Vibrated Monolithic Brick Pavement on U. S. 30 After Tamping and Before Filling Brick Surface with Cement Grout. Lip Curbs Formed by Wedge-Shaped Brick at Edges.

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reported several times to the Highway Research Board. The monolithic brick section which was not vibrated but included center and transverse expansion joints, according to R. R. Litehiser, Chief Engineer of Tests, has "given excellent service." It was principally because of this record that the Ohio Highway Department decided to increase the use of the type.

In 1915 and 1916 Professor C. C. Wiley of the Civil Engineering Department of the University of Illinois, performed a series of tests on monolithic brick slabs in comparison with solid concrete and concluded that "a monolithic brick road is as strong, inch for inch of thickness, as the usual concrete road." Recent flexure tests in the laboratory of the Research Bureau of the National Paving Brick Association show that, with the vibrated monolithic brick surface in compression, as it is in almost all conditions of traffic loading, the brick slab is superior to concrete of the same total thickness. The U. S. Public Roads Administration have now in progress a further investigation of vibrated monolithic slabs, including both stress and fatigue tests.

As in the case of the original Illinois pavements, most old monolithic brick pavements have had excellent rec-

Application and Surface Removal of Asphalt Filler During the Construction of the Brick Pavement at the New Jersey Plaza Entrance to the Lincoln Tunnel Under the Hudson River in New York City.

ords. Because of accepted practice of the period and lack of modern construction equipment many of them had an uneven surface, and the inspectional methods were not of the high standard of today. Where failures occurred they were in practically all cases due to ruptures caused by improper provision for expansion, contraction and ordinary vertical displacement. With modern specifications, design and engineering supervision, there is no question but that the monolithic brick pavement is due to receive increasing preference. It is a rigid slab type with a highly durable, weather and traffic-resistant factory-made surface.

In the Future

When contemplating what part paving brick will play in the construction of the traffic ways of the future, it is pertinent that the general design details of these highways have become crystallized in the thinking of engineers. Express highways on the primary system of the United States in the future will, for the most part, be limited ways, that is access to them will be very much restricted and traffic flow will be facilitated by a reduction of interference and friction. The turmoil of war has served to emphasize the indispensable place of such highway facilities in plans for national defense. Traffic lanes on the highways of tomorroy will be wider and center media strips or parkways will separate opposing streams of traffic. There will be no direct access to or from abutting property and pedestrians will not be permitted. Railroad grade crossings will be eliminated. An important feature will be the separation of intersecting highways and the use of the cloverleaf or some similar design with traffic, where it merges, always entering on the right. There will be provision for traffic acceleration at entrances and deceleration after departure. In the case of city streets, elevated highways and depressed or underground vehicular thoroughfares are predicted for the near future. These are the features needed to make a road safe and convenient as possible and there will, therefore, be little necessity for further modernization after the highways are constructed. It is essential that the type of pavement correspond with the probable permanence of the improvement in general. The divided traffic, limited access, elevated grades, tunnels and similar improvements on these super-roads, will inevitably attract a heavy concentration of traffic that cannot easily be detoured. These vehicles should not be caused the expense and inconvenience of interruptions due to the necessity for repair or reconstruction of the paving surface. A pavement that can meet these requirements will be in demand on the highway of tomorrow.

THE ROAD SHOW ON THE AIR

ROADS AND STREETS and Powers Road, Street and Public Works Catalogue will put the Road Show on the air each day, starting Sunday, January 28, from 5:00 to 5:15 p. m., direct from its booth, H-5, at the International Amphitheater, over Station WIND, a Columbia Broadcasting Co. affiliate. The opening broadcast, Sunday, January 28, at 5:00 to 5:15 p. m., will be a preview of the Show and the program each day during the Show thereafter will informatively touch on pertinent highway subjects of interest to the motoring public, gas tax diversion, interregional highways, etc. Conforming with ROADS AND STREETS policy of service to its readers, a telephone will be available in our booth, on which incoming calls will be taken for those in attendance. Young ladies will be present to take messages and messenger boys will be on hand to run errands. On exhibit will be two panels of highway field characters, who have a few things to say, occasionally, to highway officials and the public. One is Willie B. Damd, that vociferous, irritated individual, the Gas Taxpayer. The other is A. Puddle Jumper. These men have a pointed, worthwhile message, which you should see. Willie B. Damd is the critical, complaining mouthpiece of the Illinois Road Builders' Association. A. Puddle Jumper is the anonymous critic for ROADS AND STREETS. They are a good pair! More will be heard from them in the future. We invite you to watch the radio broadcasts and to make use of the many services offered at our booth, H-5, the first aisle corner booth to the left of the entrance on the main floor.

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Developments In

ENGINEERED ASPHALT DESIGN

Indicate Future Road Economies

By BERNARD E. GRAY
Chief Engineer, The Asphalt Institute

THE year 1939 marks a new high in the use of asphalt for road and street construction. Many factors have contributed to this remarkable gain, but several are of such outstanding importance that the review this year will be devoted largely to them rather than merely to a description of types.

Several years ago at a convention two engineers were talking about methods of surfacing highways with asphalt. One was from New England, the other from the deep South. Said the Northerner, "We place a 2½ in. hot asphalt top upon a 4½ in. stone base of sand-bound macadam, and it takes the heaviest traffic." Said the Southerner, "You must have a mighty good subgrade because we have to build thicker surfaces than that upon our clay soils." A good subgrade! Not so long ago this was the attitude, but times have changed and the present trend is *to build* a good subgrade if one is not naturally present. Interestingly enough, the Southern engineers have become leaders in this new technique.

This conception of first building sound subgrades is the most outstanding single development of the past few years. A study of the 48 states indicates that this practice is becoming general and that the subgrade properly is being considered as an integral part of the pavement structure. The older practice of making heavier pavements to care for bad soil conditions is giving way to the cheaper and better practice of building subgrades of high bearing power. While it is required for all types of pavements, the benefits show up markedly in the flexible type because thickness may be reduced in almost direct proportion to subgrade improvement.

Subgrade Design

Of the several methods, the first is densification of the natural soils themselves. The effect of such procedure is often the equivalent of several inches of pavement. Many states now call for subgrades to be consolidated to 90 per cent or 95 per cent density as measured by the Proctor test. The paper by Ira B. Mullis, entitled "Principles Applying to Highway Road Beds," appearing in the September, 1938 Proceedings, American Society of Civil Engineers, is worthy of careful study. As a result of wide study of surface failures, Mr. Mullis states that "no case (failure) is recalled in which the bulk density of the *roadbed* was in excess of 1.50." (Bulk density $= \frac{\text{Dry weight in grams}}{\text{Bulk volume of mass in cubic cms.}}$.) In other words by building subgrades to densities maintainable the year around above this figure, no pavement troubles occur.

One state, Florida, definitely calls for a subgrade of 30 lb. minimum bearing power. Several states require that soils of the A-4 to A-7 class be covered with some pervious material or be in some way modified. Arizona suggests a new method of determining base thickness according to soil characteristics.

For many years the writer has called attention to the wasteful practice of unclassified excavation, whereby the weathered top soils are so frequently thrown away and the unstable subsoils are left as the subgrade on which a pavement is to be placed. Most of the ills which have

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surrounded pavement construction of all types have been due to subsequent subgrade movement which largely could be *prevented* by building subgrades from weathered soils. Inasmuch as these soils are relatively cheap, a layer of 12 in. or more in depth can be placed for a fraction of the cost of a pavement and yet the effect is equivalent to a substantial thickness in pavement. Selected subgrades having high stability, of course, lead to thinner surface sections and resultant economy and freedom from maintenance.

An interesting development is noted in Texas where tests are made to detect suitable deposits of materials for subgrade construction. This is known as "the electrical resistivity instrument," and the procedure is a type of geophysical study. The equipment can be set up and readings taken at 1 ft. intervals down to 10 ft. in about 20 minutes. According to reports the procedure is very successful and permits the discovery of deposits which are not available by surface examination and which are difficult and expensive to find by the usual test pit method.

One state in referring to failures of road-mix surfaces some years ago notes that the combination of 6 in. base and no subgrade treatment led to uncertain results, while by improving subgrades according to soil studies and increasing base thickness to 8 in. the greatly increased traffic of present day is carried without failure. The question of improving subgrades by adding granular material has often deterred engineers because of fancied expense.

Soil Stabilization Surface Completed in 1939 in Virginia, Using MC-3 Cutback Asphalt

In most parts of the country such material is on the contrary not expensive, and Table I is inserted to show just what the various depths do cost.

TABLE I—Cost Per Square Yard When Selected Granular Material Ranges in Cost from $0.25 to $2.00 Per Cubic Yard

Depth of Granular Material Added Over Subgrade Ins.	$0.25 cu. yd.	$0.50 cu. yd.	$1.00 cu. yd.	$1.50 cu. yd.	$2.00 cu. yd.
2	$0.02	$0.03	$0.06	$0.08	$0.11
3	.02	.04	.08	.13	.17
4	.03	.06	.11	.17	.22
5	.03	.07	.14	.21	.28
6	.04	.08	.17	.25	.33
12	.08	.17	.33	.50	.67
18	.13	.25	.50	.75	1.00

Numerous studies have indicated that for 10 ct. or 15 ct. per square yard, the subgrade support often can be brought up from only 10 lb. to 50 lb. or more after treatment.

Several states mention the use of an insulation course over the subgrade prior to surfacing. The writer first noticed this procedure some years ago in Ohio, and which involves placing from 1 to 2 in. of screenings over the subgrade prior to placing pavement. The value of this layer is not as widely appreciated as should be the case. In the construction of macadam and gravel bases, it is a well known fact that in certain soils a loss of metal is encountered due to the intrusion of the soil into the aggregate layer. Furthermore, obtaining suitable density in the base course is retarded because there is not sufficient resistance in the subgrade against which to roll. By placing this insulation course, a solid subgrade is established much as would be the case of putting down a layer of plank, so that when the next layer of aggregate or paving mixture is applied there is little or no deformation and rolling quickly produces a dense consolidated course. It is the writer's firm belief, based on observation of this procedure, that 1½ in. of screenings on a clay soil is equivalent to 3 in. of crushed stone without the use of screenings, and the inclusion of an insulation course as a requirement in the construction of new stone and gravel foundations is urged as desirable and economical construction where screenings are cheaply available.

The use of liquid asphaltic products in stabilization of subgrades is increasing rapidly and is particularly valuable where local stable aggregates are scarce. Both cut-

Gravel Surface Treatment in Indiana; SC Road Oil and Powdered Asphalt

back asphalts and emulsions are employed for the purpose, and the laboratory procedure for determination of asphalt content, moisture content and other controls is developing rapidly into an established technique.

Influence of Traffic on Design

Another important development controlling design of asphalt pavements and surfaces is the change in the character of traffic. Ten years ago flexible types of surfaces, particularly light treatments, where surfaces had been constructed by traffic-bound methods on rural highways, were showing signs of extensive failure. Road-mix and even penetration macadam surfaces were showing increasing costs of maintenance. This maintenance took two principal forms: one, the repair of pot-holes where the surface was breaking down, and the other edge failure

Road-Mix Under Construction in Virginia

and settlement. Practically all passenger vehicles at that time were equipped with cord tires, while the majority of trucks had either solid tires or else cord tires which approached them in behavior. Impact was a decided factor because when a vehicle so equipped dropped into a depression there was little give to the tire.

This condition has completely changed and it is safe to say that the impact effect under modern tires is practically negligible. The reason is that even though a vehicle passes over a high spot in the pavement and a drop is experienced, the contact area of the balloon tire with the pavement is immediately enlarged and the load per square inch under impact is but little if any more than under static loading. Recent studies on airplane tires indicate this fact to a marked degree. It explains the fact that with the general adoption of the balloon tire many old thin surfaces which were on the verge of failure in 1928 and 1929 have been salvaged under simple maintenance methods and have been improving steadily ever since.

The present load per square inch under the largest truck is probably less than that under the wheels of a 2-horse wagon of 20 years ago. This factor has not yet been taken into full account in pavement design, and it is noted here in order to bring out the fact that it is the *loading per square inch* and the *character of the margin of tire contact* which properly should be taken into consideration, rather than simply the total wheel load. This factor is taken into consideration by the writer in the formula suggested for determination of pavement thickness.

Effect of Width

Another important development is the widening of asphalt surfaces. The effect of width of pavement is far more important than generally realized. Much of the failure which occurred formerly was due to concentration of loads at the outer edge of the pavement. While the better ditch construction today has increased the uniformity of subgrade completely across the roadway width, nevertheless the edge of any payement is still its weak spot and the intrusion of water beneath this edge under particularly adverse conditions of ice and snow may lead to lowered subgrade resistance. By increasing pavement width as will permit considerable lateral movement, the likelihood of any areas being overstressed is largely eliminated.

Inasmuch as this ties up with the studies in regard to safety, it is recommended that two lane pavement widths on main highways be a minimum of 22 ft., and for old pavements of lesser width that the berms be given such treatment as will make them practically homogeneous with the pavement itself. It is believed that the trend for 2-lane pavements is toward 24 ft. as the minimum and that all experience indicates that pavements of that width can be constructed of such thickness, that for a given volume of material it is better design to have this width in a thinner section rather than a 20 ft. width and a thicker section.

Influence of Improved Equipment

No review of this kind should fail to pay tribute to the genius of the equipment manufacturers. The effect of equipment applies in several ways to present day design, the first one in regard to preparation of the road cross-section. One does not have to go back very far to remember when the flow line in a highway ditch was often inadequate due to the difficulty of readily removing rock and ledge points with equipment then available. Frequent pockets would be encountered in ditches which led water to the subgrade with resultant failure of the pavement due to loss of subgrade support. *This one item* has been changed to such a degree through the use of power equipment that the water table under modern highways has been lowered to provide more nearly uniform subgrade support throughout the year.

Another point in regard to equipment is cheap haulage. The radius of economical haul from any given source of aggregates has been greatly extended, so that it is possible to employ materials for foundation construction to take care of modern traffic needs at costs which are little more than one-half to one-third of what they were ten years ago. This coupled with easy construction of wide roadbeds and lowered water table makes for economical construction of sound foundations.

Likewise for asphalt surface courses of all types, cheap haulage has permitted mobilization of materials in storage and stockpile and then with favorable weather conditions to rapidly complete the construction project in a short period. There is practically no limit to the construction rate of bituminous surface types, inasmuch as they may be used immediately after placement. Several states indicate that with cheaper hauls the type of surface has been changed. Two trends appear: (1) that with construction of solid subgrades, heavy asphalt surface treatments are often adequate where formerly greater pavement thickness was employed; (2) that asphalt plant mixtures are becoming almost as economical as road-mixes in many areas, especially under adverse climatic conditions. Such plant mixtures are being hauled as much as 50 miles, while a 20-mile haul is an every day procedure.

A most complete study of the influence of equipment was presented at the Twelfth National Asphalt Conference held in Los Angeles in February of this year, under the general chairmanship of Mr. J. L. Harrison of the U. S. Public Roads Administration. Even for those who have been constantly associated with the highway field, it is nothing short of amazing to look back and see how rapidly equipment has been improved and how greatly costs have been lowered, so that types which would not have been economical as recently as ten years ago are now invading the low cost field. A study of this report is recommended.

The improved design of asphalt mixing plants is especially notable, both in respect to capacity and cost of output. The average cost of asphaltic concrete has been reduced over 50 per cent since 1920 and 25 per cent since 1930. Some plants now turn out well over 1,000 tons per 8-hour day. The development of alloy steels which permits the construction of plants having little or no main-

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As revealing as an X-ray . . . see-all, know-all about bituminous distributors with Etnyre's sensational new "FOTO-FACTS"! Pictorially exposing generally hidden features, the whole machine, from cab to spray bar, is taken apart right before your eyes. You can see where others may "cut corners" for a cheaper price . . . why, when you pay a *little* less, you may get *much* less. And you see how, under Etnyre's experienced manufacture, the *Black Topper* gives you *much* more for a *little* more! Get this inside story now—call your nearest Etnyre dealer — see "FOTO-FACTS" — and get *MORE FOR YOUR MONEY!*

"WhiteWing" COMPANION PRODUCT TO ETNYRE'S "BLACK TOPPER"

The street sanitation system of a dozen uses—protects the "Vital Zone" where people eat, work and play—keeps your city clean and healthful.

Fearlessly GUARANTEED FOR TWO YEARS

Only precision-built machines of Etnyre quality . . . exclusively designed and carefully constructed from selected materials . . . could be so fearlessly guaranteed. And not only are you protected from mechanical defects when you buy a *Black Topper,* but you are assured that each machine will conform with all municipal, county, state and federal regulations.

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Oregon, Illinois, U.S.A.

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ALABAMA
Birmingham—Alabama Machinery & Supply Co.
Montgomery—Alabama Machinery & Supply Co.
ARIZONA
Phoenix—Neil B. McGinnis Co.
ARKANSAS
Little Rock—Little Rock Road Mchy. Co.
Little Rock—Hug-Arkansas Truck Co.
CALIFORNIA
San Francisco—A. L. Young Machinery Co.
Los Angeles—Crook Co.

COLORADO
Denver—Paul Fitzgerald
Denver—Timpte Brothers
FLORIDA
Jacksonville—M. D. Moody
GEORGIA
Atlanta—W. C. Caye & Co.
IOWA
Waterloo—Waterloo Construction Co.
KENTUCKY
Frankfort—Frankfort Equipment Co.
LOUISIANA
New Orleans—Southern States Equip. Co.

MICHIGAN
Detroit—Keller Tractor & Equipment Co.
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Jackson—Mississippi Culvert & Mchy.
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Kansas City—G. W. Van Keppel Co.
MONTANA
Billings—Petrie Machinery Co.
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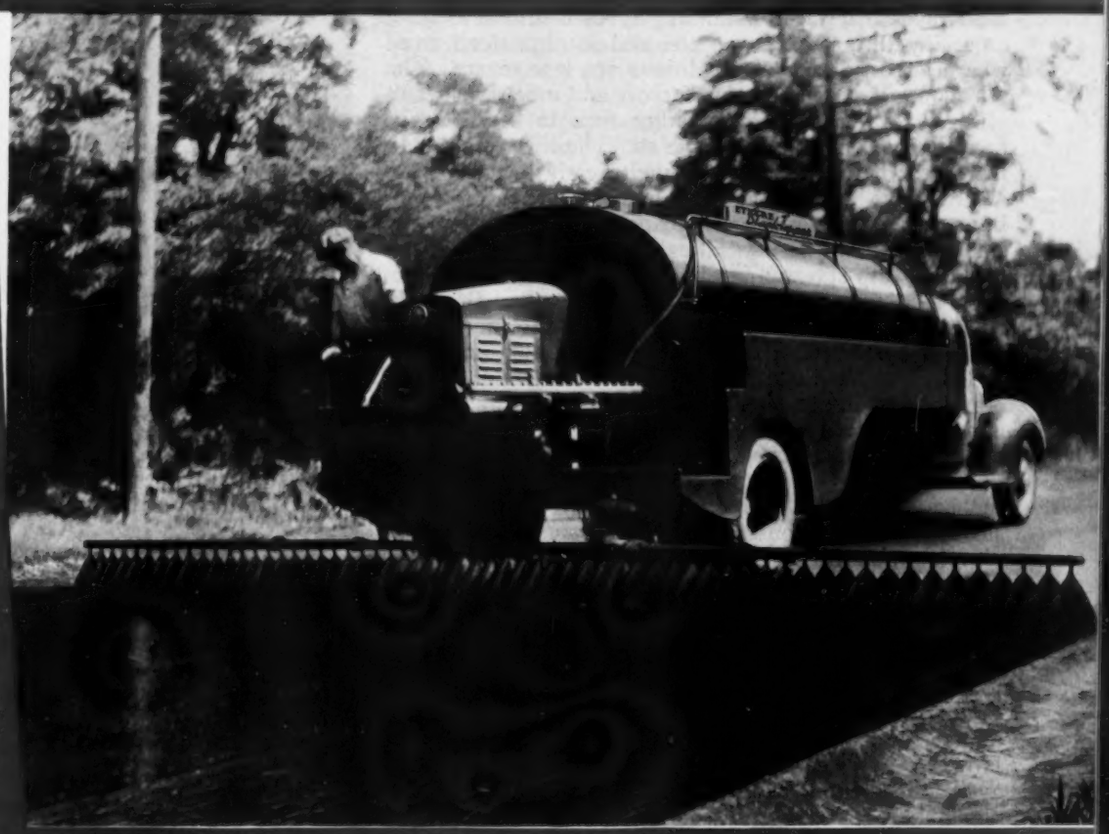
Omaha—American Mchy. & Supply Co.
NEW MEXICO
Albuquerque—H. J. Hastings Co.

REVEALS SENSATIONAL STORY BEHIND

1940 ETNYRE "BLACK TOPPER"

NOW MORE THAN EVER BEFORE

NO DRIPS
NO LEAKS
NO SKIPS
NO STREAKS



DOZENS OF EXCLUSIVE FEATURES TO SAVE YOUR MONEY TO SAVE YOUR TIME

★ *"No-Drip" Circulating Spray Bar* —Instantaneous action—no slobbering—no waste of material. Individual valves at each pair of nozzles. Ends fold, raise and lock for traveling. Adjustable for proper height of spray . . . for any width of spray up to 24 feet.

★ *"Vacu-Flo" Cleaning System* — forces unused material from spray bar to tank—material never wastes, congeals, or freezes to clog distributing lines. Flushes entire system with just 3 quarts flushing oil!

★ *Slotted, Non-Clogging, Triple-Lap Nozzles* — for smooth, uniform application throughout entire length of spray bar — actual tests show *less than 2% variation* between deliveries from any given nozzles!

★ *Compact Circulating System* — takes shortest distance from tank to spray bar—no waste of heat or energy in long travel of hot or cold materials! Leak-proof—no pipe fittings — easy servicing of individual parts. Handles emulsion *without segregating elements in suspension!*

★ *Positive Displacement Pump*—the material *must* go through — no churning! Only TWO moving parts. Measures material—delivering even, non-pulsating flow. Big capacity, efficient suction.

★ *Choice of 3 Engines* — Ford V-8 front drive, Le Roi front drive or Le Roi rear drive. Every one specially designed for most efficient transfer of power.

★ *Heavy-Duty, Double-Sealed Tank* —in all standard sizes, any special size. Individually engineered. Double-thick insulation.

★ *Simple, Safe Controls*—so easy to handle that even a school boy can operate a *Black Topper!* One or Two-Man types, amply safe-guarded.

"NO-DRIP" TURN-UP SPRAY BAR

For traveling, bar raises and folds. Adjustable to any length up to 24'. Divided at center point — spray through either side.

Raises and lowers for efficient coverage. Shapes to conform with road crown. Ends swing back preventing damage from road obstructions.

No drips! To stop spraying, bar turns up, returning all material through *Vacu-Flo* system to tank. Leak-proof unions. No waste!

ETNYRE BLACK TOPPER
ROAD BUILDING SYSTEM

NEW YORK
[illegible] York—Good Roads Mchy. Co. of [illegible] Y.

NORTH CAROLINA
[illegible]—Carolina Tractor & Equip[illegible] Co.
[illegible]—Carolina Tractor & Equip[illegible] Co.

OHIO
[illegible]—G. W. Holmes Co.

OKLAHOMA
Oklahoma City—Wylie-Stewart Mchy. Co.

OREGON
Portland—Howard Cooper Corp.

SOUTH CAROLINA
Columbia—Jeff Hunt Road Mchy. Co.

SOUTH DAKOTA
Rapid City—Rasmuson Equipment Co.

TENNESSEE
Knoxville—Wilson-Weesner-Wilkinson Co.
Memphis—Memphis Tractor Co.
Nashville—Wilson-Weesner-Wilkinson Co.

TEXAS
Dallas—Conley-Lott-Nichols Mchy. Co.
Houston—R. B. Everett & Co.

UTAH
Salt Lake City—Lund Machinery Co.

VIRGINIA
Richmond—Natural Asphalt Corp. of Va.

WASHINGTON
Seattle—Howard Cooper Corp.

WEST VIRGINIA
Charleston—West Virginia Tractor & Equipment Co.

tenance and the development of oil burners for drying, together with much more efficient design of the dryers themselves, have radically altered the position of plant mixtures in the paving field. A new type of "shock heat" dryer is shortly to come on the market which promises to still further extend the trend toward plant mixing of aggregates formerly placed as road mixtures.

However, with all this development in better and cheaper plants, the extension of use of asphalt mixtures is so rapid that the road-mixing types continue to gain, especially through the western and southwestern areas where adverse weather conditions are less severe. The selection of type is being made more and more as a result of study of local behavior rather than to build a type because someone else had done so. The several types of travelling mixers have contributed greatly in this field.

Probably in no aspect of equipment change has there been a greater improvement than in producing the final surface. One of the difficulties of flexible type construction ten years ago was in obtaining a smooth riding surface. Old specifications are clearly evident of this fact, wherein tolerances were permitted of from ¼ in. to ½ in. variation in 10 ft. The mechanical spreaders and more recently the combination mechanical spreaders and tampers have revolutionized this end of the work, and there is no reason today why tolerances for pavement smoothness should not be as close for flexible types of construction as for any other type. Asphalt plant mixes easily can be laid to a tolerance of ⅛ in. in 10 ft. and many surfaces are being constructed under even stricter control. No plant-mix work now should be permitted (except in certain city street work or small jobs elsewhere) other than with mechanical means of spreading.

Influence of Aggregate Availability

Engineers are giving more thought to the economics of commercial plant operation. In asphalt types there are a number of surfaces from which selection may be made. However in such choice, attention should be given to the availability of local aggregates, and the limitation of the manipulative process. These factors often have been overlooked in the past.

By local aggregates is meant not merely the wayside products but principally the ones which are the output of commercial pits and quarries. Stone and gravel vary in different sections of the country in respect to the sizes

Blading Sand-Asphalt Mix on Road in Maryland Eastern Shore, 1939

Road-Mix in Virginia—One Side Being Completed While Traffic Uses Other Half

obtained from the most economical methods of reduction. Cognizance should be taken of this fact, and specifications should be writen to best use the *complete output of plant.* Such procedure is immediately reflected in cost. As an example, in Oregon where rock is plentiful, stone bases are the natural order. In Massachusetts where hard rock is found, the penetration type of construction is a logical procedure. Where finely textured surfaces are required the employment of the penetration type as base with a thin asphalt plant-mix top is one desirable method to use the full quarry output. The point to be emphasized is that design should take into account the commercial side of the picture, and that the closest cooperation should prevail between the commercial producer and the engineer in order to work out the most satisfactory combinations.

Consideration of Thickness

Closely tied in with the economical use of aggregates are the thicknesses of base and surface courses to be employed, and which are often governed by the character of manipulative processes. Thus in penetration macadam, 2½ or 3 in. depth is best because stone can be prepared efficiently in these sizes and asphalt cement can be forced into the voids in a satisfactory manner. Asphaltic concrete can be consolidated in layers up to 4 in. for coarse mixes, and to better advantage in 2 to 3 in. layers for finer mixtures. Road-mixes can be mixed, spread and rolled in depths up to 3 in., while surface treatments can be handled best in depths less than 1 in.

Base thickness is being more and more determined by balancing cost of increased depth against cost of raising subgrade support. Usually the base thickness will be determined by the maximum amount capable of being constructed in one layer, as it is usually cheaper to increase subgrade support than to build two or more layers of base. For example, 4 to 5 ins. waterbound macadam base is an economical depth to construct in one layer and for this type such thickness is usually sufficient. It is deep enough to use commercially available stone to advantage, and to be closely keyed together so that no weak areas develop. If greater support is required it will be better usually to incorporate additional aggregate with the subgrade soil to produce mechanical stabilization and the needed support. Table II shows typical thicknesses and quantities required for various types of surface in common use. Perhaps the most notable fact about this

table is that it shows to what an extent these surfaces are composed of *aggregate* and that the per cent of asphalt is small.

Resurfacing

One of the big highway problems, present and future, is the reconstruction of pavements which have become inadequate for present day traffic. Not only is it an engineering problem, but a fiscal one as well. It is easy enough to tear up the old road and build a new one, but the engineer will be doing his job best when he considers the possibility of salvaging the present pavement to the fullest extent consistent with present standards of alignment and grade. This is not as hard as it sounds, and the great majority of old roads are capable of being widened and resurfaced with asphaltic types to very real advantage.

In planning such work, attention to certain details will have a market influence on cost. For example, it costs just as much to set up a plant for an output of 5,000 tons as it does for 25,000 tons but to the contractor and the purchaser the cost *per ton* is markedly reduced when the larger tonnage is employed. Thus by simply planning work so as to let work in substantial volume, large savings can be secured. Even if individual jobs are small, by grouping a number together to be built from one plant set-up, the engineer will more than earn his salary for the year, in savings to his employer.

Again, by designing work so that base and top can be manufactured in one plant, substantial savings result. "Black Base" utilizing aggregate up to 2½ in. maximum diameter is becoming routine procedure as the modern plant can easily handle such coarse mixtures. They take less asphalt because of smaller surface area, they are strong structurally because of high internal friction, and because the full pit or quarry output is utilized the aggregate cost per ton is lowered. Incidentally the development of special trenching and rolling equipment for widening operations has greatly reduced costs for such work and also insures complete compaction.

In some states widening work is accomplished one year, employing macadam types, using the widened areas under traffic as berms, and resurfacing the following year after full settlement has taken place. This procedure frequently uses WPA labor to great advantage.

It is desirable again to point out that the practice of constructing rigid type headers for asphaltic concrete surfacing on rural highways is undesirable if not positively damaging. Such headers almost always separate from the surfacing, allow water to enter, hold such water at the low points in the grade, all with resultant softening of the subgrade. Incidentally they cost several times the amount of a similar width of asphaltic concrete. The practice originated with need for establishing the new gradient of surface, but with present spreading and finishing equipment, such procedure is no longer necessary and it is being largely abandoned. Properly designed asphaltic concrete is completely stable and requires no lateral support. In some states the usual steel side forms are employed in just the same manner as for portland cement concrete.

In general, widening and resurfacing calls for the following operations: (1) Trenching out for widened areas; all widening on one side or the other will often correct bad alignment. (2) Placing of an insulation course of sand or screenings to consolidate subgrade. (3) Placing coarse graded asphaltic concrete base in widened areas to level of old pavement edge. (4) Placing a leveling course (variable thickness) over old pavement and widened areas to proper cross-section and profile. (5) Placing of surface course (uniform thickness) over new roadway width. (6) Placing of thin seal top (optional).

The trend in both plant and road-mix construction is to construct all the lower courses of coarse graded aggregate mixtures, and to have a thin waterproof top course. Present day traffic tends to tear up a road surface rather than to hammer it down. Present day surfaces tend to dry out rather than to become too rich. Thus by constructing the lower courses on the lean side and the thin top on the rich side, entirely stable pavements are secured which at the same time are waterproof and resistant to abrasion.

Summary

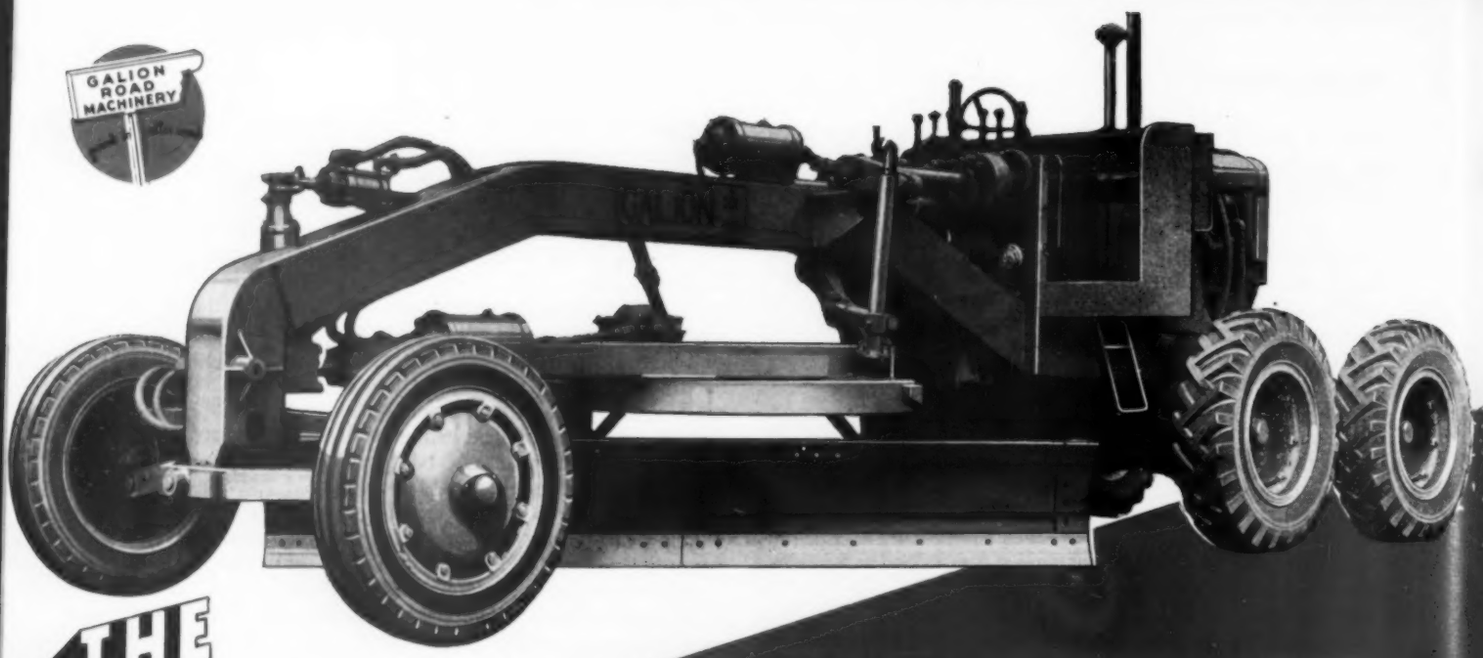
Much might be written on the subject, but for the moment it is enough to say that the following trends and influences are most important.

1. The principal development in design of "flexible pavements" is the increasing attention to subgrade: viz, the actual design of the subgrade as a part of the pavement structure, having definite minimum support values.
2. The almost universal use of the balloon tire has so reduced load concentrations that even though traffic volumes have greatly increased, the damaging effects of impact formerly experienced have practically disappeared.
3. Efficient power equipment with attendant low cost of operation has greatly extended radius of economical haul of selected aggregates, and their manipulation. Surface types formerly in the high cost class are now competing in the low cost field, while the quality of all types is markedly improved.
4. The trend toward coarser type plant mixtures is to be noted, and that such mixtures are less critical to design in respect to stability due to the structural strength of the aggregate itself.
5. Resurfacing of old pavements with asphaltic concrete employing "black base" for all widening work leads to marked economy.

TABLE II—THICKNESS AND QUANTITIES FOR TYPICAL TYPES ASPHALT PAVEMENTS.

Type	Thickness	*Weight Aggregate Per Square Yard: Coarse Aggregate	Fine Aggregate	Sand	Filler	Asphaltic Material Per Square Yard: Primer	Seal
Light surface treatment	¼ in. to ½ in.	...	25 lbs.	...	..	..	0.25 gal.
Heavy surface treatment	½ in. or more	...	30 to 60	...	..	0.5 gal.	0.3
Light road-mix seal	½ in. to 1 in.	...	50 or more	...	..	0.2	0.8
Road-mix (macadam aggregate type)	2 in.	174 lbs.	18	...	..	0.4	1.1 mix and seal
Road-mix (dense graded type)	2½ in.	237 total all sizes including 200 mesh		...	..		2.0 to 2.4 total
Penetration macadam surface	2½ in.	217	35	...	..		Total 2.4
Penetration macadam base	3 in.	260	25	...	..		Total 1.65
Asphaltic concrete surface	2 in.	126	..	65	11		Total 1.7
Asphaltic concrete base	3 in.	204	..	84	..		Total 2.1
Topeka type	2 in.	...	59	114	20		Total 2.1
Sheet asphalt	Binder course	100	..	36	..		Total 0.85
	Top course	...	..	115	23		Total 1.9

*Weight aggregate based on specific gravity of 2.65.



THE LATEST GALION DEVELOPMENTS

If you take in the Road Show this year BE SURE to stop at the Galion booths where a cordial welcome and a complete line of road machinery units awaits you.

SEE — the new No. 201 motor grader with medium weight and power.

SEE — the Galion CYCLONE, a new self-propelled, high speed earth mover which DIGS — CARRIES — SPREADS, with 15 cu. yd. capacity and 160 H. P. diesel engine.

SEE — the most complete line of all-purpose rollers.

SEE — the big Heavy Duty 12 ft. motor grader built for the heaviest kind of construction and maintenance work.

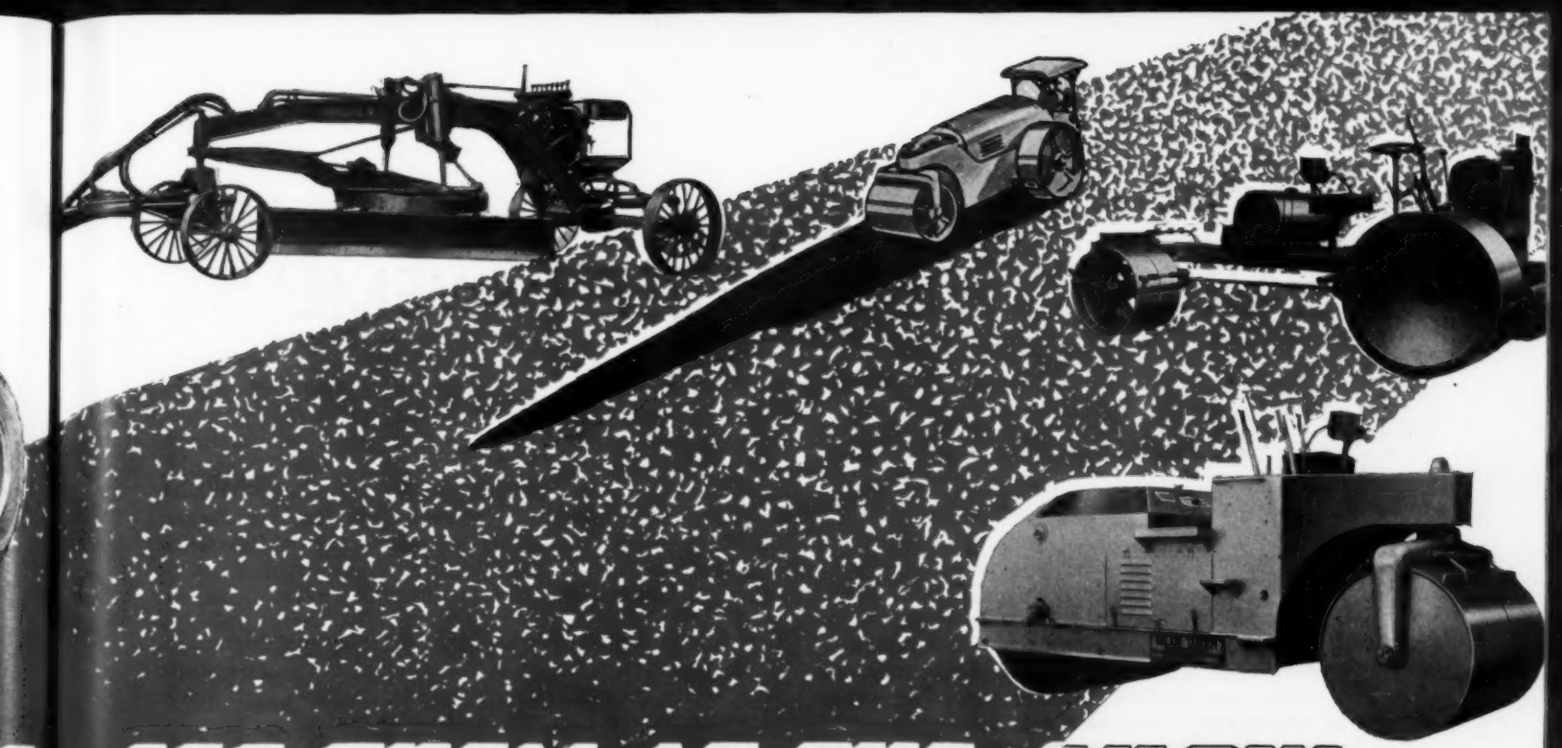
In case you do not get to the show, we will be glad to send you literature covering any of the units shown here.

THE GALION IRON WORKS & MFG. CO.
GALION OHIO

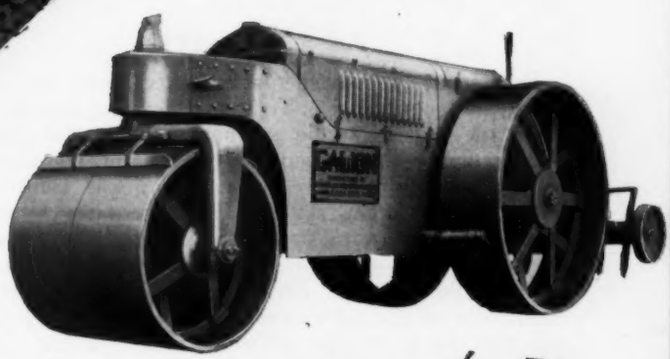
GALION

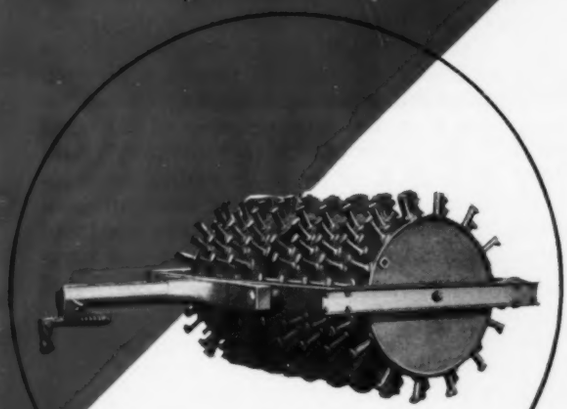
Road Building and Maintenance

EQUIPMENT



SEE THEM AT THE SHOW





The new Galion No. 201 motor grader is shown at the top of opposite page. The No. 120 pull grader is shown left-above. The rollers shown include, from top to bottom, the trench, tandem, 3-wheel and portable. The sheepsfoot roller is shown at the left. The new "CYCLONE" earth mover is shown below.

Developments

REGARDING CONCRETE PAVEMENTS

During 1939

By W. F. TEMPEST
Highways and Municipal Bureau, Portland Cement Association

PIONEERING work in introducing concrete as a pavement material is now a matter of history, but developments go on from year to year. The extensive use of concrete pavement demands this.

Traffic and changing conditions demand forward-looking plans and improved design. Economy in construction demands improved construction practices and equipment. Public interest requires consideration of safety and permanent improvements that will make highway travel more enjoyable.

Advances in 1939

Permanent improvements are necessary to reduce maintenance expenses. To this end wider use is being made of built-in traffic markers. Even the familiar black center line will soon be a permanent, maintenance-free feature if methods devised in Texas continue to find favor in other states. Tennessee has expressed enthusiasm and other states are considering its use. It was also incorporated in a substantial paving program in an Ohio county. The process (patented) consists essentially of special means for applying a black coloring material to a 6-in. width of new concrete surface. A black iron oxide or ferroso-ferric oxide is the material used. This is blown on the surface and then troweled in so that there is a penetration of ⅛ in. to ¼ in.

Always one of the leaders in improved highway features and design, New Jersey has developed and made use of a new light reflecting precast curb. It forms part of the center dividing strip on separated highways. This special curb design is constructed of concrete made with white cement. Extensive use has also been made of white cement concrete for regular curbs.

The simplicity of design and the pleasing effects possible with architectural concrete have resulted in the selection of concrete for most of the modern highway structures. Grade separation structures employing the rigid frame type of design, stream crossings and all drainage structures are made attractive and built economically of concrete.

Light Reflecting Precast Curb Has Been Installed on Several Divided Highway Projects in New Jersey. The Black Corrugated Concrete Filler Between the Curbs Contrasts With the White Cement Curbs and Gives the Driver a Long Series of Lights and Shadows Which Accurately Define the Edge.

Design

The outstanding feature of highway design continues to be the divided highway. Here the adaptability of concrete plays an important part.

More than one thousand miles of four and six lane divided highways are now in service. Of this mileage approximately 83 per cent is portland cement concrete. No particular standard has been established but rather the designs have been fitted to the physical conditions of the locality and the traffic demands.

There is no standard descriptive term for the center dividing strip. Some refer to it as a parkway area, a median strip, neutral strip, mall, or simply a dividing strip. The width normally varies from 4 to 40 ft.; for average conditions a center dividing strip of 20 ft. is usually selected. The pavement for each roadway varies in width from 20 to 24 ft. or more, depending upon locality and conditions. The outside traffic lanes are usually wider than the inside passing lane. There is a trend toward wider pavement to provide safety for fast moving traffic and 10-ft. traffic lanes are not considered

Lee Highway, U. S. 70, in Knox County, Tenn., Is the First Divided Highway in the State.

adequate for advanced design of these separated highways to accommodate large volumes of traffic. Such highways are urgently needed for adequate service in populous sections of the country.

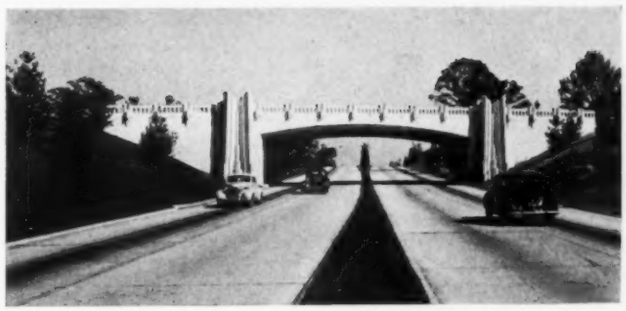
One of the outstanding 1939 projects was the Pennsylvania Turnpike described in detail in a recent issue of this magazine. Another outstanding project was the extension of Merritt Parkway. This beautiful stretch of divided highway is entirely free from cross traffic. Although avoiding actual entry into towns, it serves communities from metropolitan New York to New Haven, Connecticut. During 1939 construction was marked by the completion of many miles of wide highways four and six lanes in width and many miles of divided highways. In the cities, too, elevated or depressed highways and separated traffic arteries have helped to solve traffic congestion problems and to reduce accident rates.

In all parts of the country attention has been given to design for increased traffic coupled with traffic safety. Traffic and safety requirements demand careful selection of type and skillful design suited to the peculiar conditions of a particular project with consideration not only for present needs but for anticipated demands of the future.

Showing Congested Traffic Conditions on Northwest Highway Through Des Plaines, a Suburb of Chicago, at River Road Intersection.

Surveys, investigations and research have kept highway engineers, equipment men and contractors on the alert. The highway industry with all of its many ramifications is one of the top industries in the country. Guided by the Public Roads Administration and supported by intensive research work of the Highway Research Board and technical discussions of leading groups such as the American Association of State Highway Officials, road building continued to forge ahead in the United States. The real incentive for road building activity in 1939 was the economic benefit and the social values and this kept our progress in road and street building ahead of other countries. Our motorized transportation continued to increase during the year both in number and use. Durable, low maintenance cost pavements are needed to meet traffic demands and our research work has been directed towards insuring the quality of the materials going into the pavements and also the construction methods of building roads and streets.

Many states continued experiments with vibratory methods of placing and finishing. On several projects



Merritt Parkway, Connecticut, Grade Separation. The Architectural Treatment of Each Crossing Is Different.

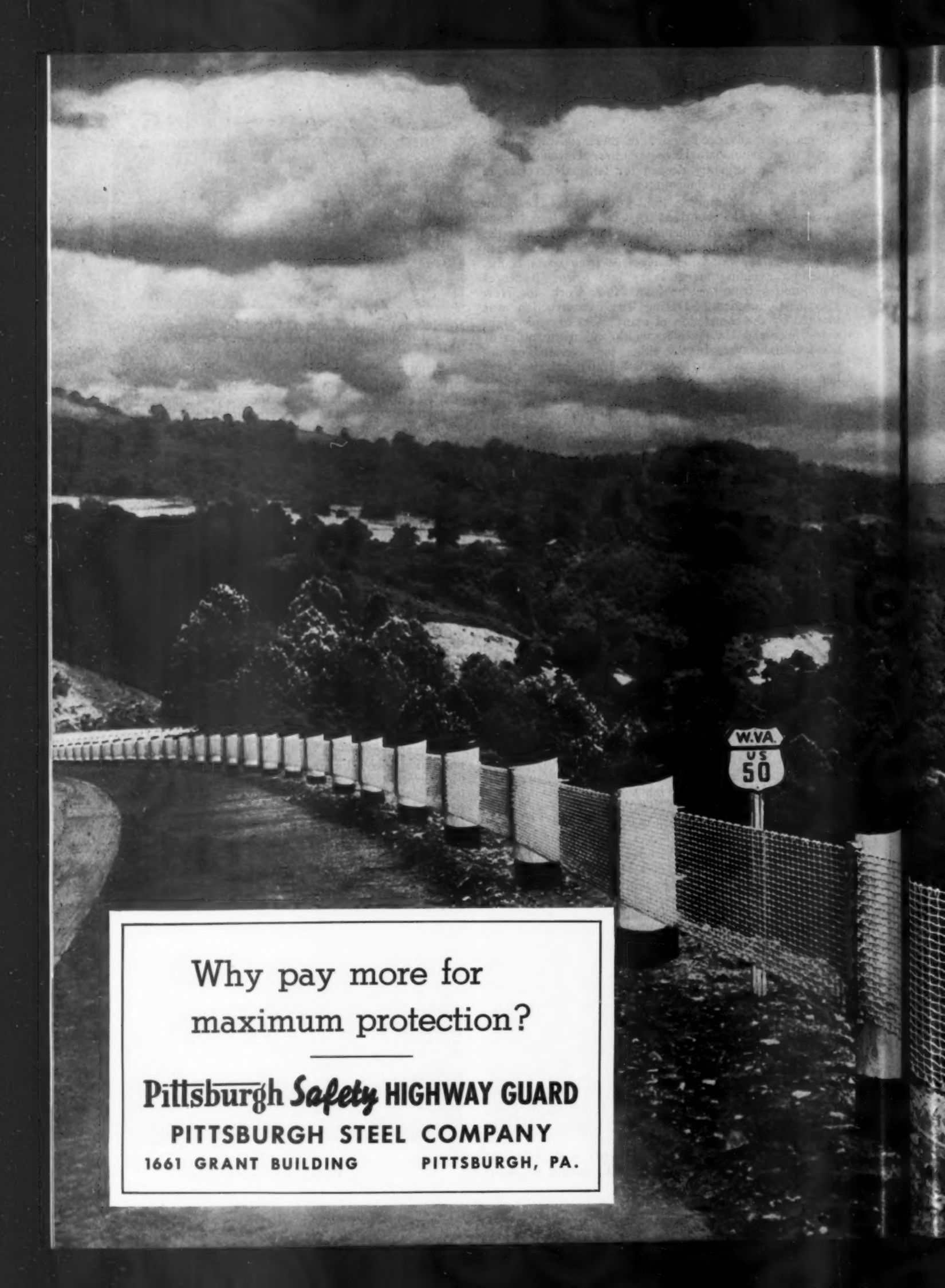
in Pennsylvania and New York a new piece of equipment, referred to as a screw spreader, was used. This is designed to substitute machine spreading for hand spreading of concrete. New equipment and new methods must undergo thorough field tests before they are generally accepted and for this reason developments in highway and street construction, particularly in concrete work, are steadily progressive rather than spectacular.

The same may be said for design. Investigation continues on such important details of design as joint spacing and transfer of load across joints. The trend seems to be toward longer spacing of expansion joints with intermediate dummy joints to control cracking. Many engineers have inclined toward this feature of design and 1939 saw greater recognition and wide use of this jointing design.

Great importance has always been attached to the uniformity of the pavement surface. Today more than two-thirds of the states require surface variations to be less than ⅛ in. in 10 ft. and no state permits more than ¼-in. variation. These exacting requirements demand careful attention to finishing methods and contractors may well be proud of the pavements built in 1939. During the year contractors made increased use of the mechanical float.

Concrete pavements as built today are the result of painstaking scientific research and the fine cooperation of engineers, contractors, equipment men, automobile manufacturers, motor users and those organized groups of citizens who from the early days of road building, by their public spirited efforts, have encouraged extension of road and street facilities and have aided in progressive road improvements and the art of building them. With such support the building of permanent highways will continue just as long as we continue to make use of highway transportation and regard the automobile as a means of better communication commercially and of gaining relaxation and pleasure socially.

Pedestrian Crossing on Ramona Blvd. at Pomeroy Ave., Los Angeles, Facilitates Pedestrian Traffic.



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PITTSBURGH SAFETY HIGHWAY GUARD
P

OBSERVATIONS BY THE WAY

By
A. PUDDLE JUMPER

¶ Following from an anonymous source tells its own story:

EXPENSE REPORT

Month Ending October 31, 1939

Date Oct.		Amount
1.	Advertising for girl stenographer	$ .50
2.	Violets—new steno. ...	.65
8.	Week's salary for stenographer	15.00
9.	Roses for stenographer	3.00
11.	Candy for wife.....	.75
13.	Lunch with stenographer	6.25
15.	Week's salary for stenographer	20.00
17.	Movie—self and wife..	.80
18.	Theater tickets — self and steno.	7.50
19.	Candy for wife.....	.75
20.	LILLIAN'S salary.....	25.00
21.	Theater and dinner with Lillian	21.75
22.	Fur coat for wife.....	625.00
23.	Advertising for man steno.	.50

• •

¶ I had to chuckle about this abstract from letter from Mr. C. C. Oleson, District Concrete Engineer for the Pennsylvania Turnpike Commission:

"Mr. Morgan, Safety Engineer here, was telling me about finding you in the mud hole somewhere along the turnpike. I'm sorry that I didn't have the opportunity to meet you, because I happen to be very much interested in all Gillette Publications, and am therefore interested in knowing more about the men who are responsible for them. Better luck next time.

"Incidentally, when I heard about you being stuck in the mud, I couldn't help but wonder if you were along with "A. Puddle Jumper," I always read his page of "Observations" and get quite a kick out of them. Apparently he covers a lot of territory and records many of his observations with his camera."

• •

¶ Prof. Ben H. Petty, Purdue University, has, like most of those who scan these pages, a sense of humor. He snapped the sign shown

herewith on a farm adjacent to Indiana State Road 43, just north of Raccoon, Ind. This farmer is not so dumb.

• •

¶ Remember way back when—

Asphalt had to be fluxed with a residue oil to the point where "it could be chewed without sticking to the teeth?"

An asphalt company furnished foremen with chewing samples?

Aggregates were measured by the shovel full?

Concrete was considered "permanent"?

Team haul for aggregates was 25 cents a ton-mile?

Every bridge and road grading crew established a camp near the job?

You never left the office without mud chains and a shovel?

The class professor led you to believe you'd go out and set the world on fire?

Team outfits used Mormon boards in grading?

Were those the "good old days"?

H——, no.

¶ ——A DRIVER'S DICTIONARY

(From January, 1939, issue of Public Safety)

AMBER LIGHT — Something the other fellow is supposed to wait for while you drive through.

ANTI-FREEZE — An odoriferous fluid which runs out of your busted radiator when you don't have enough of it in.

BACK SEAT DRIVER—See "Matrimony."

BUMPERS — Projecting horizontal bars which prevent pedestrians from denting your radiator grille when struck.

CALL OF THE OPEN ROAD—"Hey! Whaddya think you're tryin' to do?"

CAR WASHING—A modern ritual which gets the same results as the ancient rain dance.

CHANGE OF OIL—When the salesman stops talking mechanical improvements to you and begins telling your wife about comfort and beauty.

CIGAR LIGHTER—A gadget on the dash-board which works only when Junior sticks his finger in it.

DE LUXE MODEL — Any standard job with a built-in vanity case.

DETOUR — The longest, roughest distance between two points.

EMERGENCY BRAKE — An upright lever which the groping hand can readily find just a few minutes after the emergency has passed.

FINGER WAVE—Signal by a lady driver that she is about to turn left, turn right, back up, or knock the ashes off her cigarette.

FLAT TIRE — Something you can get by picking up a tack or a strange blonde.

GARAGE—A convenient small building for the storing of the lawn mower, garden tools, sleds, porch furniture and, if room, the family auto.

GAS GAUGE—A dial indicating that you have just enough fuel to get half-

way between the next two filling stations.

GLOVE COMPARTMENT — A handy place for sticking little souvenirs of your trip, like the fish-heads Bobby tucked away and forgot about last summer.

HORN—A device of which Satan needs two, but the dopey demon of the downtown traffic jams does a better job with one.

JACK—You must have it to raise a car, and you must raise it to have a car.

MECHANIC—Any man with a felt skull cap, three wrenches and a convincing car-side manner.

NEWS—Man Mortgages Home to Buy Automobile!

OLD MODEL—Any car on which the factory paint is dry.

PARKING SPACE—Gap in line of cars along the curb, occupied by either a driveway entrance or a fireplug.

REAR VISION MIRROR — A small rectangular looking-glass by means of which the driver may spot a traffic cop in time to think up an alibi.

ROAD HOG—Any driver ahead of you in a line of traffic.

RUMBLE SEAT — Corruption of English word, "grumble," meaning to "squawk, beef, or otherwise register discontent."

SCENERY—A green patch glimpsed through a gap between billboards.

SOFT SHOULDERS—A good thing to keep your wheels and your hands off while driving.

SPARE PARTS—Available for autos, but needed most by pedestrians.

TOURIST HOME — An institution which congests the roadsides during the day, becoming scarcer as dusk approaches and non-existent after 8 p. m.

TRUCK—An almost stationary obstruction encountered on winding roads and long hills.

TRADE-IN VALUE — An element which the car owner believes should increase, like the quality of wine, with age.

• •

¶ One story, some one dug up about the history of the bulldozer, is related to the Mormon board. The Mormon board worked all right as long as the team could be kept in front and the material pulled into place. It always skidded sideways when one tried to move material over the edge of a dump. It was on such a job that someone conceived the idea of mounting the board on the front end of the pole between the oxen—hence the name of "bulldozer." That's Frank Nikirk's story, anway.

¶ The rock on the Pennsylvania turnpike project was certainly tough on tires. This is a scraper tire.

Many truck and wagon tires showed severe cuts.

• •

¶ Have you ever stopped to think that the operations of the things we call "scrapers" and 'graders" are just the reverse of what these names indicate? The "scraper" digs and moves earth—*grading,* or I'm a Chinaman—while the "g r a d e r" *scrapes* the surface. Of course, the "grader" moves a little dirt, and of course it shapes up the "grade," but if anything *scrapes,* it does. No, let's not try to change the terms; that would mean too many headaches.

• •

¶ My good deed for the day is the recollection of a good thought. Elbert Hubbard once wrote:

"If you work for a man, for Heaven's sake work for him. If he pays you wages that supply your bread and butter, work for him, speak well of him, stand by him and stand by the institution he represents. If put to a pinch, an ounce of loyalty is worth a pound of cleverness. If you must villify, condemn and eternally disparage, resign your position, and when you are outside, damn to your heart's content. But as long as you are a part of the institution do not condemn it. If you do, you are loosening the tendrils that hold you to the institution, and the first high wind that comes along, you will be uprooted and blown away, and probably you will never know why."

¶ A. P. J.—Why were the two little ink drops crying?

Willie B. Damd—Why?

A. P. J.—Because their mother is in the pen.

• •

¶ In a letter from C. D. Wells, Construction Engineer, Texas State Highway Commission, recently, we abstract the following list of choice information:

"We have, of course, used white cement in making precast or poured concrete center stripes for asphaltic concrete construction in which we use a white silica sand, and the results have been very satisfactory. I might add that the results are not satisfactory unless this white sand is used.

"One of our contractors has developed a method of protecting this white stripe from the asphalt material, which is very economical and satisfactory. It consists essentially of preparing a flow paste and applying what is commonly called oil finished wall paper, cut to the width of the stripe, the paper being applied directly on top of the stripe. After the asphalt work is completed the stripe is flushed with water, the paste is softened and the paper is easily removed. It can be cleaned off with a brush and water and is in almost perfect condition."

• •

¶ Loading holes about 6 ft. deep for shooting rock on N. R. Corbisello's contract on Pennsylvania Turnpike

near Everett, Pa. Staked holes indicate loaded holes.

¶ The old and the new. Bridges at Piqua, Ohio, running at right angles to Route 25.

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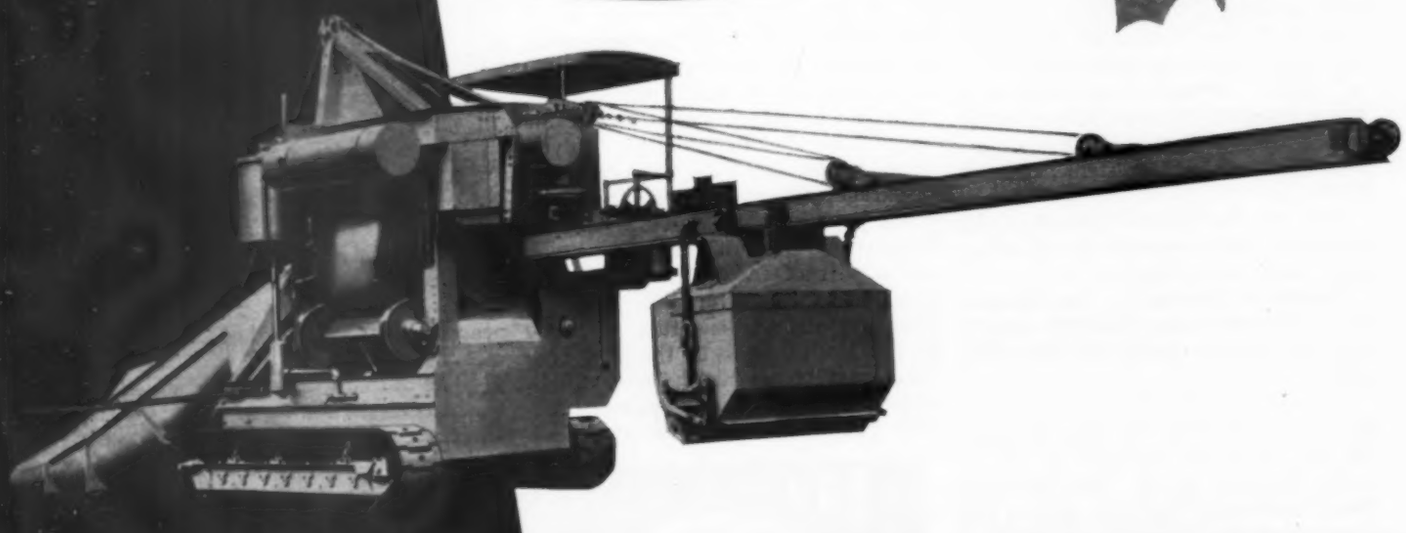

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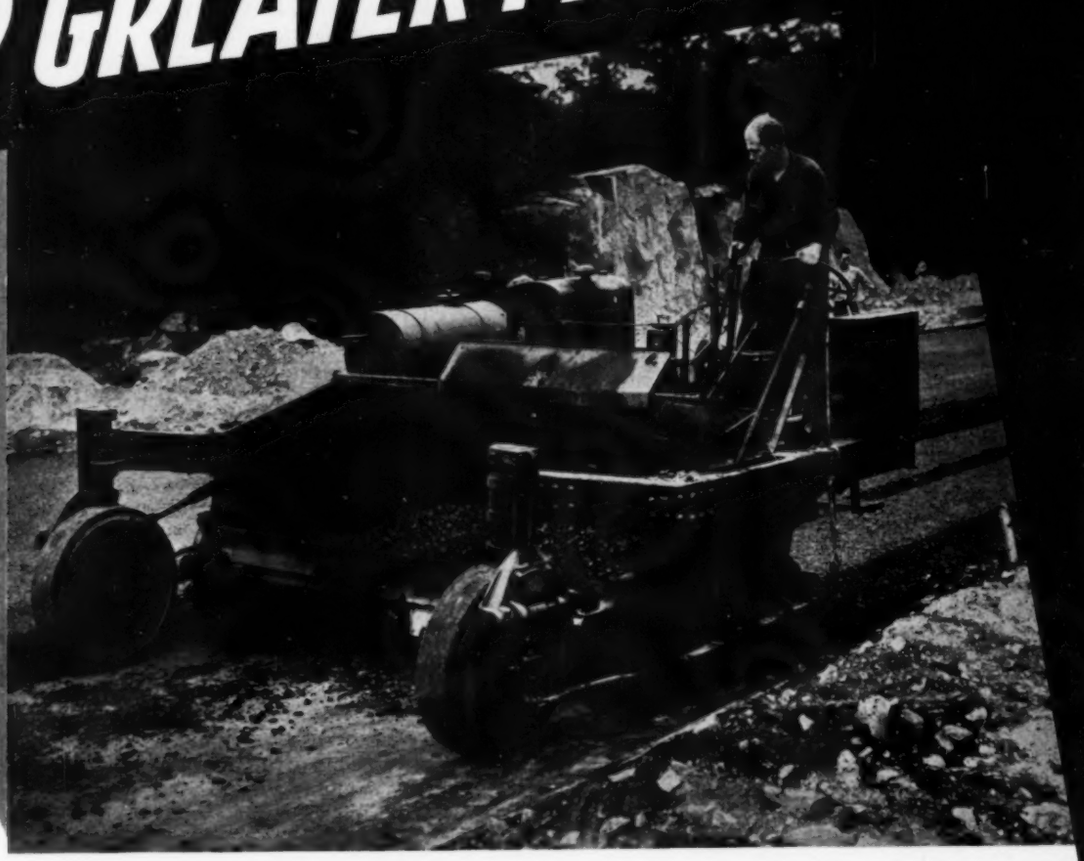

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EDITORIAL

LIMITATIONS OF ADVICE

GOOD engineering is based, fundamentally, upon the integrity of character, honesty, strength of will, judgment, and spirit of cooperation of the man who is grounded in engineering principles. Qualified by these attributes his advice is sought and if he is in a position of executive control his advice may appear to be rendered in the form of an order or as instruction through pressure. Up to a certain point, pressure advice given by an engineer who is worthy of the title is justifiable and is ethical. It is easy, however, for the engineer not qualified by the attributes enumerated to "slop over" and become dictatorial. Engineering supervision over construction work approximates a sacred trust. It is from the violation of the trust that unethical practices ensue.

True, an engineer is only a human. As such, he naturally develops an opinion or preference for one method of construction with respect to another method, or for one piece of equipment with respect to another unit. That preference, however, should in no way affect the fair exercise of his authority over the work. On this fine line of demarcation hinges many of the violations of ethical engineering practice. A common violation is the "bought" engineer.

The statement has often been made that "every man has his price." How true this may be the writer is in no position to know. An example of it, however, recently came to the attention of the writer. From a reliable source it was learned that a man in a position of authoritative control over a piece of construction work on a large eastern highway project informed a contractor, not by inference but by direct statement (dictatorial, if you please), that he had better purchase a certain manufacturer's piece of equipment or he would have difficulty in getting his work accepted. Whether this man is an engineering inspector or an engineering executive is beside the point. It demonstrates, however, the existence of this fine line of demarcation between ethical and unethical engineering practice. Had the engineer advised the contractor of his reasons for preference based upon results desired and then left the subject for analysis by the contractor, his advice would have been welcomed and his actions would have been ethical.

It is an engineer's duty to require results in conformity with the mandates of the plans and specifications, regardless of the method of construction employed or the make of equipment used. It is *not* his duty to instruct a contractor as to whose make of equipment the contractor must use. The unit owned and in operation by the contractor may not be giving the specified results. It is the engineer's duty to point out this fact in a friendly cooperative spirit, and to refuse to accept the results. From this point onward, the troubles belong to the contractor until satisfactory results are obtained. At the best, our plans and specifications are none too good. The qualified engineer recognizes this fact, as does the cooperative contractor. In a spirit of co-operative endeavor for the best prosecution of the project, a policy of "give and take" is mandatory. Not a policy of "give" by some equipment manufacturer or the contractor so the "bought" engineer can "take," but a policy of cooperative interpretation of the specifications in order to obtain desired results.

Whenever an engineer or his authorized engineering inspector dictates to a contractor what make of equipment to purchase, or even infers that if he did not buy that particular make that final acceptance of the job would not result, it is the writer's belief that the engineer is either dumb or is "bought." It is hard to believe that he is dumb or he would not have been placed in a position of executive or quasi-executive control in the beginning. Hence it must be inferred that his "price" has been met. There is no place in the engineering profession for the man who prostitutes his authority. Highway construction work must be performed with a spirit of cooperation between contractor and engineer. There is no place in this scheme for the "bought" engineer.

On the other hand, there is a definite place for the engineer whose advice is sound and is based upon desired results. There is a definite limitation to this advice. Lest we "slop over" the line we should be particularly cautious in how we render our decisions.

▼

DRIVING IN VIRGINIA

HAVE you ever felt oppressed? Have you ever felt you were being regimented? You know, this is a free country, or is it?

Certainly one thing we know is that we like to feel unrestrained, unoppressed, and free to move. That's just how the writer felt while driving over the streets and highways of Virginia after having spent two days driving over the highways of Pennsylvania. In Virginia, gone are the speed limitation signs along the streets and highways of the commonwealth, with the exception of an occasional sign, near the city limits of a few cities, on which notice is given of the maximum speeds specified in Virginia's motor vehicle code. Texas follows somewhat the same plan.

From the writer's observations of the application of Virginia's speed laws, he believes the code administrators assume a driver to be a gentleman until proven otherwise. State squad cars were in evidence, but they molested no driver who drove in a gentlemanly manner, or who practiced the courtesies of the road. A driver may have been traveling 65 or 70 miles an hour, but so long as he drove safely and courteously, he was not stopped. The state built those nice wide smooth highways so the public could enjoy them. The writer doffs his hat in respect to those southern gentlemen of the law who apparently have the same repugnant feeling against restraint and oppression, as the motorist, and permits him to drive speedily so long as it is safely with respect to others. The writer always feels like a fugitive whenever he gets onto Pennsylvania's roads. Every few minutes, at cross roads, past hedges, beyond school houses, at gas stations, he searches the roadway in back of him through his rear view mirror to see that a state squad car is not tailing him. It is virtually impossible for him to poke along at 50 miles an hour; so, he drives his regular 70 mile speed and, like a fugitive, furtively glances ahead, behind, and on both sides to watch for cops. All this extra energy is taken away from that which would ordinarily be employed in watching the road ahead.

In Virginia one finds none of those unreasonable, restrictive speed zones as found in many other places. In three days driving over the roads and streets of Virginia, the writer can honestly say that he saw no driver driving recklessly or unsafely, and furthermore, he saw many fast drivers practice the courtesies of the road and observe the intent of the motor vehicle code without being watched from an alley, or filling station, or from behind

some hedge by a state squad car.

While discussing Virginia's highways the writer wishes to pay tribute to the highway department for the wholesale elimination of those landscape despoilers, the advertising signs. Gone are thousands of those unsightly blots. Maybe not gone with the wind, but certainly gone like the wind. To further add to the enjoyment of motoring, roadsides are trimmed, parked, and landscaped.

Driving on Virginia's highways, one feels a freedom of action, no oppression, no restraint. One begins to feel that maybe, after all, this *is* a free country.

COOPERATION

COMMENDABLE action portraying a spirit of friendly cooperation was taken recently at the time of the annual meeting of the Pennsylvania Associated Constructors, an organization of street and highway contractors. The association authorized the appointment of a committee to meet with engineers of the Pennsylvania Turnpike Commission for the purpose of clarifying claims intended to be presented to the commission. This committee could possibly take one of two forms: either a membership made up of contractors involved who have time to devote to this work and are willing to spend their time on it, or a membership made up of an outside engineer, an attorney, and the secretary of the association. The latter scheme seems to the writer to be the most practical one.

Claims that arise on the Pennsylvania Turnpike are like the following:

1. Waiting for final plans and drawings of bridges so construction may proceed.
2. Extra expense involved in returning to a place where construction was omitted, like paving over a fill allowed to settle over the winter when it was bid on the basis of construction continuity.
3. After having poured the footings of a structure, it is relocated and concreting must be done in winter instead of under favorable summer conditions anticipated when the unit bid price was filed.
4. A contractor gets all ready to move out from a job which he was told would not be built, then decision to go ahead was announced, requiring winter construction instead of favorable weather construction.
5. Construction work on one section, delaying the contractor on the adjoining section, who is ready and waiting to go to work.
6. Time extensions.

These are but a few of the numerous types of claims which the committee or Board of Adjustment (which it might be called) would consider and get in presentable form before filing with the Pennsylvania Turnpike Commission. By cooperative action with turnpike engineers before filing claims, undoubtedly many claims without just foundation will be returned to the contractors with the reasons why the Board considers them as not being justifiable. The Board action would have no legal standing whatever. If the Board should advise against filing a claim, the contractor is still free to file it if he so desires.

The intent and purpose of the proposed Board is to cooperate with the turnpike commission in getting a common understanding on the validity of claims before they are filed.

Another function of the committee or Board will be to try and arrange with the turnpike commission for payment of semi-final estimates. At present, monthly estimates are allowed on work performed but only 90 per cent of the estimate is paid.

Often after completion of the work several months elapses between final acceptance and final payment. The 10 per cent is retained all of this time. A contractor having completed a $1,000,000 worth of work has $100,000 tied up for which he must wait. If he continues work on another job he must borrow to have working captial. Hence he is out interest involved.

Since the retainers are held for protection against purely mathematical errors, after the job has had final acceptance, it occurs to the writer that a 1 or 2 per cent retainer should be plenty. Semi-final estimates in the amount of 98 or 99 per cent of the total amount due should be paid promptly upon final acceptance. Final payment should not be delayed more than 6 months.

READ IT

TO WRITE about the work of the highway engineer so that the "man in the street" will get a reasonable understanding of its complexities is an extremely difficult task. In the January 6, 1940, issue of the *Saturday Evening Post*, beginning on page 20, Mr. Loring A. Schuler painted a good word picture of some phases of California's highway engineering work.

Fundamentals of highway engineering are, of course, just as applicable in one part of the United States as in another part; local conditions cause what may seem to be non-conformity. Yet when the project is analyzed from the point of view of the elements of highway engineering, the apparent non-conformity is found to be fundamentally sound.

Mr. Schuler played up one point which is too often overlooked—research. We think he handled this subject admirably.

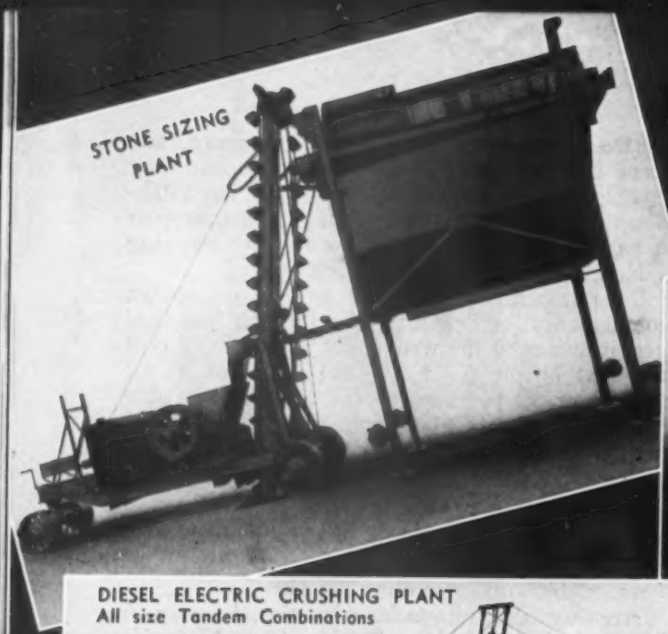
Were ROADS AND STREETS to publish such an article, as written, the editors would be severely criticized because of the way trade-marked names were used to convey the idea of classes of equipment.

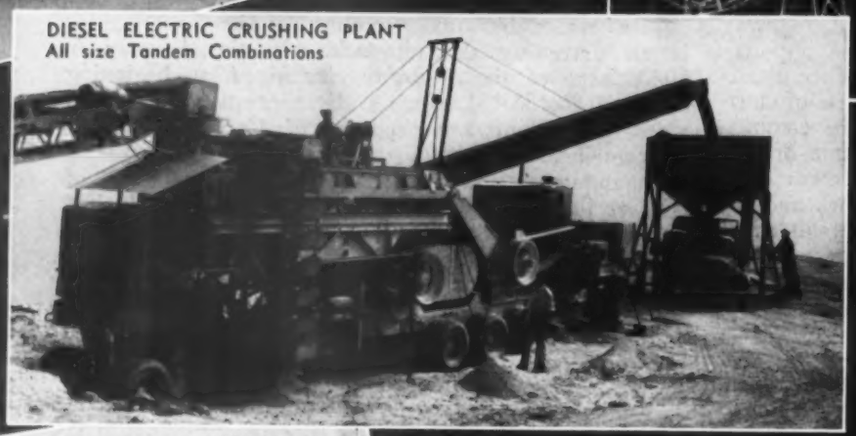
When speaking of the dissemination of new ideas or discoveries, we think Mr. Schuler should have enlarged greatly upon what was published. While the two organizations mentioned contribute their small share, many other organizations, schools, and technical publications, particularly the latter, keep the highway industry posted on new ideas and new developments.

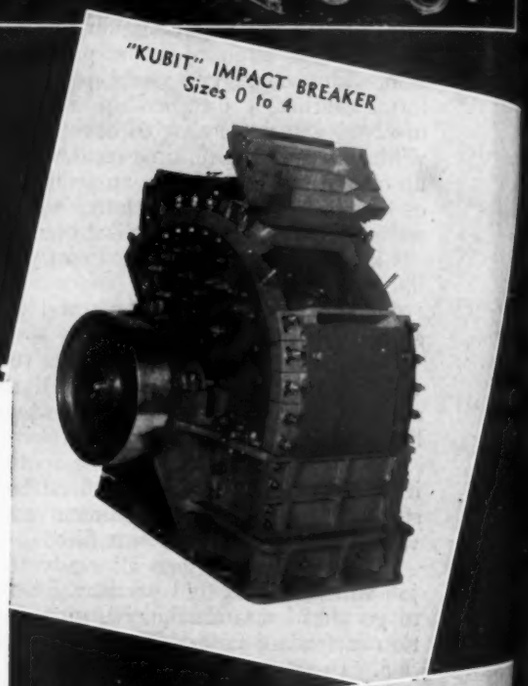
The first paragraph in the third column on page 21 is misleading and we believe the *Saturday Evening Post* should publish a correction. The following statement is made: "In effect, all our transcontinental highways, east and west, and north and south, are military roads; though we don't call them that!"

Actually, there are *no* military roads in the continental United States, except those on military reservations. The connected system of state highways which may be indicated by a line on a map, from coast to coast, are civil highways developed for economic, recreational, educational, and social reasons. True, the Public Roads Administration and the War Department collaborated in a study on a network of highways, but the results merely indicated which roads the War Department would like to see improved first, which second, and which third. It is only comparatively recently that the War Department even set up desirable standards for the three classes of roads.

The financial angle which is always hard to present popularly was well handled by Mr. Schuler, for the California conditions. He has just scratched the surface of a subject packed with human interest, filled with romance, and loaded with plot situations and personalities. We hope he digs further into the many and varied phases of road and street engineering and construction.







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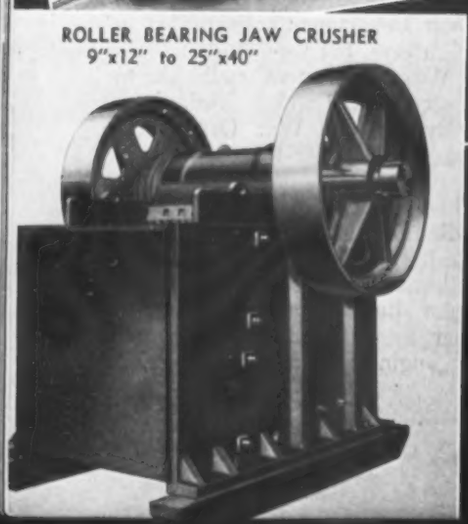

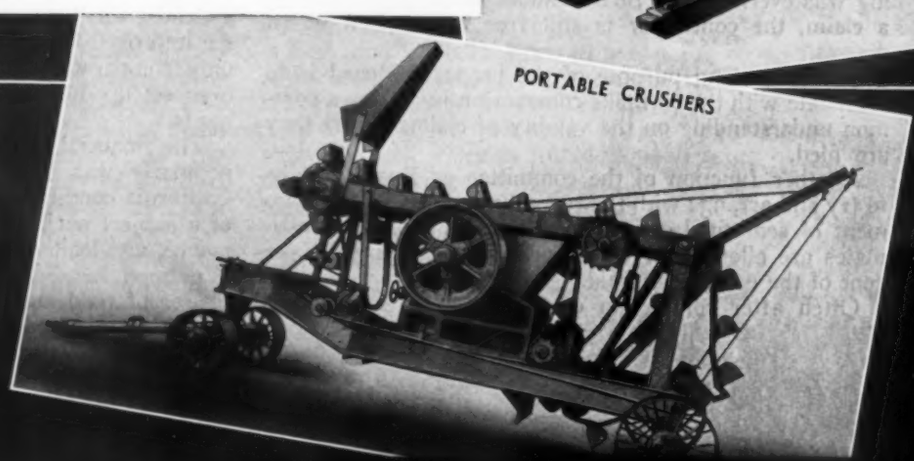

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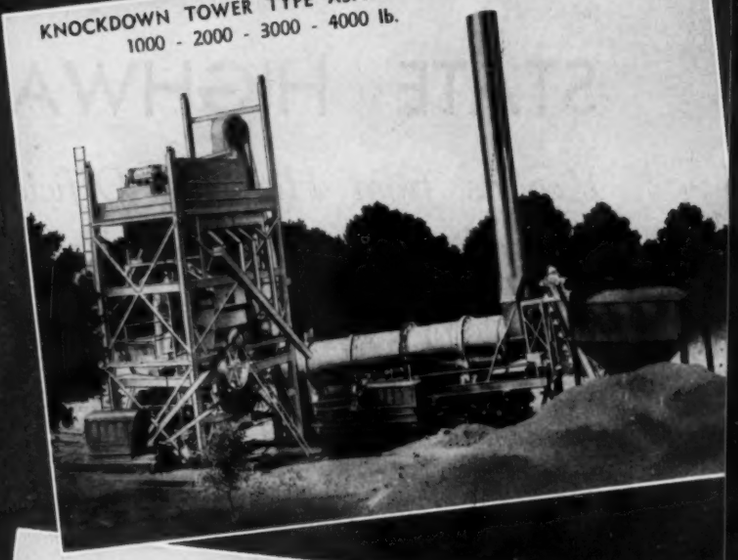

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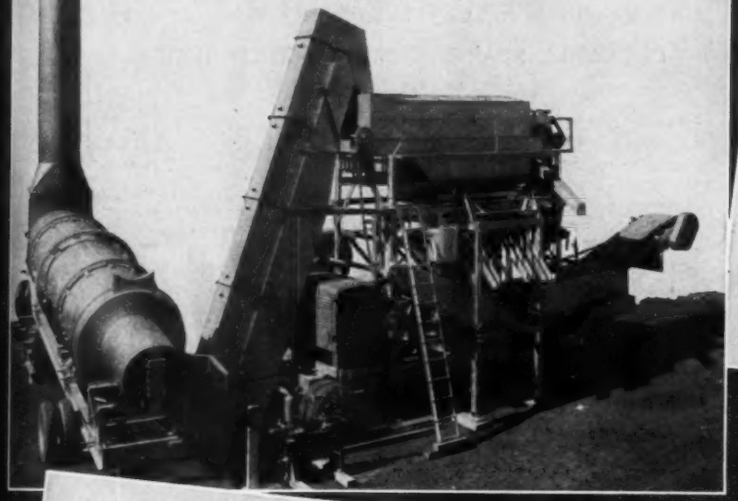

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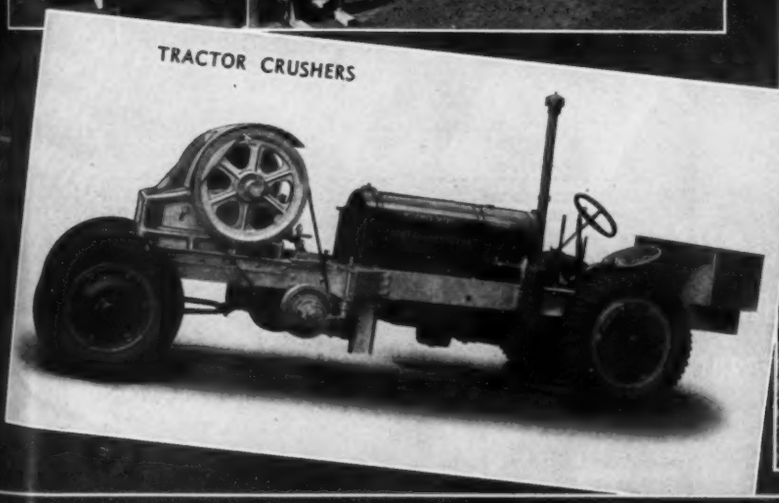

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STATE HIGHWAY CONSTRUCTION

Reports from Highway Officials Showing Mileage Completed and Expenditures in 1939 and Probable Mileage and Expenditures in 1940

NEW ENGLAND STATES

Maine

One of the principal items in the 1939 state highway construction program was the completion of 263 miles of treated gravel roads. Other items are shown in the tabulation.

STATE HIGHWAY CONSTRUCTION IN 1939

	Mileage Completed During 1939	Uncompleted Mileage Carried Over to 1940
Gravel untreated	20	..
Gravel, treated	263	..
Low-cost bituminous mix	21	5
Bituminous macadam	8	1
Bituminous concrete	14	2
Portland cement concrete	5	..
Bridges (number)	55	18
Grade separations (number)	3	5

The probable amount available for state highway construction in 1940 is $6,200,000. The construction program has not been completed but it is anticipated that the work this year will be about the same as it was in 1939.

New Hampshire

Work under the direction of the state highway department in 1939 included the completion of 60 bridges. Many structures of this kind were destroyed in the 1932 flood and hurricane. The tables show the 1939 work and the probable construction program for 1940.

STATE HIGHWAY CONSTRUCTION IN 1939

	Mileage Completed During 1939	Uncompleted Mileage Carried Over to 1940
Gravel, untreated	8	..
Gravel, treated	40	15
Bituminous macadam	8	2
Bituminous concrete	5	..
Portland cement concrete	9	..
Bridges (number)	60	13
Grade separations (number)	2	1

PROBABLE STATE HIGHWAY CONSTRUCTION IN 1940

	Miles
Gravel untreated	8
Gravel, treated	50
Bituminous macadam	10
Bituminous concrete	5
Portland cement concrete	9
Bridges (number)	8
Grade separations (number)	3

A larger sum was spent for maintenance in 1939 than was expended for construction. For construction the amount was $2,133,869; for maintenance $3,578,748. The probable funds available for state highway construction in 1940 amount to $1,960,400.

Vermont

The estimated state highway expenditures in 1939 were $4,000,000 for construction and $1,750,000 for maintenance. It is expected that $4,000,000 will be available for construction in 1940. The state highway construction last year and the probable construction for this year are outlined in the tables.

STATE HIGHWAY CONSTRUCTION IN 1939

	Mileage Completed During 1939	Uncompleted Mileage Carried Over to 1940
Gravel, treated	14.4	...
Low-cost bituminous mix	25.7	12.3
Bituminous macadam	10.7	6.6
Portland cement concrete	2.9	2.1
Bridges (number)	10 (+130PWA)	7
Grade separations (number)	0	1

PROBABLE STATE HIGHWAY CONSTRUCTION IN 1940

	Miles
Gravel, treated	43.9*
Low-cost bituminous mix	38.2*
Bituminous macadam	6.6*
Portland cement concrete	6.6*
Bridges (number)	12†
Grade separations (number)	3†

*Includes uncompleted mileage carred over to 1940.
†Includes uncompleted work carried over to 1940.

Massachusetts

State highway expenditures in 1939 included $7,588,467 for construction and $3,581,477 for maintenance. The probable amount available for construction in 1940 is $296,702, the tabulations give details of the 1939 work and the probable construction in 1940.

STATE HIGHWAY CONSTRUCTION IN 1939

	Mileage Completed During 1939	Uncompleted Mileage Carried Over to 1940
Graded	1.241	....
Bituminous macadam	13.947	0.118
Bituminous concrete	17.281	4.194
Portland cement concrete	2.742	1.785
Bridges (number)	4	2
Grade separations (number) R. R.	3	....
Grade separations, highway	1	....
*Bridges, stream	24	1
Bridges (temp.)	1	....
Bridges, repairs	4	....

PROBABLE STATE HIGHWAY CONSTRUCTION IN 1940

	Miles
Graded and drained earth	2.0
Bituminous macadam	25.3
Bituminous concrete	1.7
Portland cement concrete	0.6
Bridges (number), stream	10
Grade separations (number), highway	3
Grade separations (number), R. R.	3

Nearly 40 per cent of the state highway construction expenditures in 1939 was spent for rehabilitation and reconstruction of state highways damaged by the September, 1938, hurricane and flood. The expenditures for this work were $3,190,000.

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Rhode Island

The sum of $1,425,000 was expended in 1939 on state highway construction; expenditure for maintenance was $930,000. It is anticipated that $1,750,000 will be available for state highway construction in 1940. This 1939 work was as follows:

STATE CONSTRUCTION IN 1939

	Mileage Completed During 1939	Uncompleted Mileage Carried Over to 1940
Gravel, treated	0.1	..
Low-cost bituminous mix	2.6	..
Bituminous macadam	7.9 (4.5 4-lane)	0.3
Bituminous concrete or concrete base	1.2 (4-lane)	..
Portland cement concrete	1.8 (0.3 4-lane)	2 2 (4-lane)
Bridges (number)	3	1
Grade separations (number)	1	..
Four-lane dual type reinforced concrete and bituminous macadam	3.1	3.8

Connecticut

The proposed budget of the state highway department shows the following:

(a) Construction $9,863,320.00
Maintenance 3,660,715.00
This is an increase of about 7½ per cent over last year.

(b) Federal Aid money is shown as follows:
Regular $2,800,000.00
Other items 688,080.00

(c) The estimated income from gasoline tax, motor vehicle fines, registration fees, etc.... $16,550,005.00

During the fiscal year ending June 30, 1939, a total of 57.25 miles of highway was constructed, also 30 bridges and 8 grade separations. Also carried over into 1940 was a total of 27.65 miles of highway of several types, also 13 bridges and 6 grade separations.

Details of the state highway construction completed during the fiscal year ended June 30, 1939, are given below.

STATE HIGHWAY CONSTRUCTION

	Mileage Completed During 1938-39
Graded and drained earth	2.90
Gravel, treated	2.45
Waterbound macadam, treated	7.89
Bituminous macadam	7.39
Bituminous concrete	.34
Portland cement concrete	36.28
Bridges (number)	30
Grade separations (number)	8

MIDDLE ATLANTIC STATES

Pennsylvania

As the Department of Highways operates on a fiscal year basis, beginning June 1st of each year, it is practically impossible to give detailed data for the department's operations during 1940. Preliminary studies, however, indicate that during the next construction year the department will have available for construction purposes approximately $33,000,000.00 for new work, in addition to those projects now under way.

EAST NORTH CENTRAL STATES

Ohio

State highway construction completed in 1939 included 29 miles of treated stabilized macadam, 105 miles of portland cement concrete and 178 miles of bituminous concrete. Details of the 1939 work follow.

STATE HIGHWAY CONSTRUCTION IN 1939

	Mileage Completed During 1939	Uncompleted Mileage Carried Over to 1940
Graded and drained earth	13.13	5.67
Stone, slag, gravel, untreated	8.19	6.50
Stabilized macadam, treated	29.22	38.77
Waterbound macadam, treated	53.32	24.26
Low-cost bituminous mix	17.01	....
Bituminous concrete	178.62	6.91
Portland cement concrete	105.22	69.43
Brick	11.16	10.18
Asphalt	6.10	5.65
Bridges (number)	55	47
Grade separations (number)	11	5

In 1939 $19,000,000 was spent on state highway construction, $12,000,000 on maintenance. Probable funds available for state highway construction in 1940 amount to $20,000,000. The 1940 construction is not definitely determined but will probably compare favorably with 1939 construction.

Indiana

The following tabulation gives some details of the state highway construction for the fiscal year ended June 30, 1939:

STATE HIGHWAY CONSTRUCTION FOR YEAR ENDING JUNE, '30, '39

	Mileage Completed During 1939	Uncompleted Mileage Carried Over to 1940
Graded and drained earth	38.244	11.483
Stone, untreated	59.651	10.919
Gravel, untreated	57.323	5.919
Stone and gravel, treated, stabilized	48.807	24.263
Waterbound macadam, untreated	2.375	2.375
Waterbound macadam, treated	10.189	0
Low-cost bituminous mix—B C A	54.267	0.099
Bituminous macadam—retread	4.321	.168
Portland cement concrete	103.699	22.153
Brick	0.000	.....
Asphalt, natural rock	19.587	1.877
Bridges and grade separations (number)	98	41

State highway expenditures in 1939 for construction totaled $15,981,053, of which $12,609,544 were state funds, the remainder being Federal Aid. The probable amount available for state highway construction in 1940 is $19,533,000. The construction program has not yet been approved.

Illinois

It is estimated that $20,000,000 was expended in 1939 on state highway construction and $5,530,000 on maintenance. The funds available for state highway construction in 1940 are estimated to be $31,306,000. Details of the 1939 work are shown in the table.

STATE HIGHWAY CONSTRUCTION IN 1939

	Mileage Completed During 1939	Uncompleted Mileage Carried Over to 1940
Graded and drained earth	80	22
Crushed stone or gravel, Type B	52	..
Crushed stone or gravel, Type A	48	28
Low-cost bituminous mix	211	13
Portland cement concrete	170	26
Brick	1	..
Asphalt	6	..
Bridges (number)	64	25
Grade separations (number)	34	7

Type A gravel or crushed stone surfaces are compacted and stabilized.

Type B gravel or crushed stone surfaces are traffic bound.

Cut Costs, Speed Work . . . Use Atlas High-Early cement for cold-weather construction!

Top: *Placing Atlas High-Early Concrete.* **Note its easy workability and freedom from segregation. Atlas High-Early gives you time enough to place it properly, sets rapidly, gains full strength quickly.**

Bottom: *Race against time* **won on the Bronx-Whitestone Bridge, New York City, despite cold weather, thanks to Atlas High-Early cement.**

ENGINEERS and contractors have found that it pays to specify and use Atlas High-Early cement for cold-weather concrete. Even though this cement is slightly higher in initial cost, frequently you offset that *before you finish construction.* For Atlas High-Early cement makes possible important savings that in the long run may spell greater profits. And here's how:

Speeds Construction—Atlas High-Early cement gains strength several times faster than normal portland and so permits earlier use of concrete. You finish jobs faster, cut overhead costs, and release tools and machinery for other work. (Handy, too, when you have a penalty clause in your contract!)

Saves on Forms—As forms may be struck more quickly, frequently within 24 hours, fewer sets of forms may be needed.

Cuts Time Required for Protection and Curing—as much as 60% to 70%.

Promotes Winter Construction—Because of these factors, Atlas High-Early cement makes it economical to do work during the winter which might otherwise be postponed.

Consider these factors in studying the cost and time factors on your next job. You may be able to reduce costs, save time, and increase profits. Universal Atlas Cement Co. (United States Steel Corporation Subsidiary), Chrysler Bldg., New York City.

When you use this cement for cold weather concrete you take a jump toward lowered costs and increased profits!

RS-H-2

Atlas High-Early Cement

A UNIVERSAL ATLAS PRODUCT

Details of the 1940 construction program are not available at this time.

Michigan

State highway expenditures in 1939 included $13,500,000 for construction and $7,000,000 for maintenance and traffic service. The probable available funds for 1940 amount to $15,000,000. The state highway construction completed last year included 122 miles of treated gravel, 240 miles low cost bituminous mix, 63 miles portland cement concrete, 37 bridges and 4 grade separations. The probable state highway construction in 1940 is as follows:

PROBABLE STATE HIGHWAY CONSTRUCTION IN 1940

	Miles
Graded and drained earth	163.9
Gravel, treated	139.3
Low-cost bituminous mix	245.9
Bituminous concrete	11.03
Portland cement concrete	228.9
Brick	2.55
Asphalt	5.54
Bridges (number)	36
Grade separations (number)	10

At the time this information was obtained it was impossible to give details as the amount of uncompleted mileage to be carried over to 1940. In general, however, the figure will be the lowest in a number of years for two reasons:

1. Favorable weather conditions have permitted contractors to complete a greater amount of work than is normally possible.
2. Large amount of P. W. A. work in 1939 which required Dec. 31st or prior completion date.

The outlook for 1940 construction includes the usual matching of regular and secondary Federal Aid funds, and the expenditure of current grade crossing funds. Improved economic conditions is expected to produce an increase in gasoline tax receipts and it is hoped the Federal Aid program may be augmented by some 100 per cent state construction work. Estimates at this time place the 1940 construction account approximately 10 per cent above 1939. Present plans indicate an acceleration in concrete road construction and bridge projects, with a continuation of our low cost surfacing at approximately the 1939 level.

Wisconsin

The table gives information on the 1939 state construction program.

STATE HIGHWAY CONSTRUCTION IN 1939

	Mileage Awarded During 1939
Graded and drained earth	102
Gravel, untreated	169
Low-cost bituminous mix	398
Portland cement concrete	142
Grade separations (number)	12

The state highway expenditure in 1939 included $7,750,000 for construction and $4,500,000 for maintenance. Details of the 1940 construction program are not yet available.

WEST NORTH CENTRAL STATES

Minnesota

State highway construction completed in 1939 included 280 miles of graded and drained earth road, 342 miles of gravel road and 242 miles of low cost bituminous mix. Details of the work as well as of the probable 1940 construction program are given in the tabulations.

STATE HIGHWAY CONSTRUCTION IN 1939 (TO NOV. 1, 1939)

	Mileage Completed During 1939	Uncompleted Mileage Carried Over to 1940
Graded and drained earth	280.3	150.7
Gravel, untreated and treated	324.2	171 6
*Low-cost bituminous mix	241.7	127.0
Portland cement concrete	17.5	12.1
Bridges (number)	6	19
Grade separations (number)	10	17

*Includes oil treatment.

PROBABLE STATE HIGHWAY CONSTRUCTION IN 1940

	Miles
Graded and drained earth	510.0
Gravel, untreated and treated	90.0
Low-cost bituminous mix	44.0
Portland cement concrete	90.0
Bridges (number)	33
Grade separations (number)	6
Oil treatment	60.2

The estimated state highway expenditures in 1939 for construction were $7,805,220; for maintenance $6,477,235. The probable funds available for state highway construction in 1940 are $11,300,858.

Iowa

State highway mileage completed in 1939 was as follows: Concrete pavement, 142 miles; stabilized base with bituminous wearing surface, 107 miles; graded and bridged, including untreated gravel surface, 327 miles. Construction expenditures, $10,283,000. Probable 1940 state highway construction program: Concrete pavement, 160 miles; stabilized base and bituminous wearing surface, 40 miles; graded and bridged, including untreated gravel surface, 100 miles. Probable construction expenditure in 1940, $11,000,000.

Missouri

A total of 501.5 miles of highway construction was placed under contract in 1939. This work included the following:

	Miles
Concrete	69.1
Bituminous	128.8*
Granular	235.7
Graded and drained	67.9
Total	501.5

*Including 4.5 mi. oil treatment.

Contract cost + 10% $7,550,000

The figures for 1939 are for actual awards made during the year and do not include the work carried over from 1938, nor has consideration been given to the work which must necessarily be carried over into 1940.

The tentative 1940 highway construction program calls for the following:

	Miles
Concrete	100
Bituminous	160†
Granular	150
Graded and drained	60
Total	470

†Including 17 mi. oil treatment.

Estimated cost $10,800,000

Due to shortage of funds the state highway department was unable to place under contract last year the entire amount of work which had been programmed for 1939. This portion of the 1939 program (not awarded in 1939) has been added to the regular 1940 program. It will be noted that this is over $3,000,000 greater than the amount the department was able to award in 1939,

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● Proper maintenance of roads and streets during the winter months call for prompt removal of ice, if the accident rate is to be held within bounds.

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And, of course, brick best withstands the concentrated chain-shod traffic in snow-rutted roads or streets. The experience record of hundreds of cities and other road building units and many accelerated tests have definitely established that point.

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Exhibitor A. R. B. A. Road Show and Convention, Chicago January 29 - February 2, 1940

BRICK

Annual Meeting of National Paving Brick Association Congress Hotel, Chicago, January 30-31, 1940

FOR NEW CONSTRUCTION OR RESURFACE WORK

and the awarding of the entire amount during 1940 is dependent entirely upon the availability of funds.

Revenues in Missouri are derived chiefly from a 2 ct. gasoline tax, motor vehicle fees and federal aid. Bond retirement and interest during 1939 consumed approximately 40 per cent of all state revenue received.

By constitutional amendment no diversion of state highway funds is permitted in Missouri.

North Dakota

State highway expenditures in 1939 included $3,080,000 for construction and $1,356,711 for maintenance. It is expected that $2,770,000 will be available for highway construction in 1940.

The work completed in 1939 included 295 miles of low cost bituminous mix, 6 bridges and 4 grade separations. The uncompleted work carried over to 1940 included 31 miles low cost roads, 2 bridges and 2 grade separations.

The probable construction program for 1940 includes 122 miles low cost bituminous mix, 20 miles portland cement concrete, 1 bridge and 5 grade separations.

South Dakota

State highway construction in 1939 included 167 miles of graded and drained earth road, 274 miles of treated base course gravel road, and 119 miles of low cost bituminous mix. Details of the 1939 highway construction follow:

STATE HIGHWAY CONSTRUCTION IN 1939

	Mileage Completed During 1939	Uncompleted Mileage Carried Over to 1940
Graded and drained earth	167.0	128.3
Gravel, untreated	18.0	....
Gravel, treated (base course)	273.7	81.1
Low-cost bituminous mix	118.9	....
Portland cement concrete	25.6	....
Bridges (number)	23	20
Grade separafions (number)	0	2

The probable state highway construction program for 1940 calls for the following:

PROBABLE STATE HIGHWAY CONSTRUCTION 1940

	Miles
Graded and drained earth	150.0
Gravel, treated (base course)	200.0
Low-cost bituminous mix	165.0
Portland cement concrete	10.5
Bridges (number)	30
Grade seperations (number)	2

State highway expenditures in 1939 approximated $4,000,000 for construction and $2,250,000 for maintenance. The probable funds available for state highway construction in 1940 are approximately $4,000,000.

Nebraska

It is estimated that work was completed during 1939 on the following mileage:

	Miles
Grading	422
Gravel	386
Bituminous pavement	302
Concrete pavement	23

As well as bridges and incidental work in connection with the above.

Mileage on work which was contracted for construction during 1939 but which will not be completed until 1940 was approximately as follows:

	Miles
Grading	169
Gravel	54
Bituminous pavement	48
Concrete pavement	½

The estimated expenditure involved in the above work is approximately $6,900,000.

Estimates of work to be done in 1940 have not been completed. It is expected, however, that the mileage and money involved will be approximately the same in 1940 as in 1939, possibly some reduction in grading mileage and an increase in mileage of pavement.

Kansas

State highway expenditures in 1939 were $6,850,000 for construction and $3,663,000 for maintenance. It is probable $8,000,000 will be available for highway construction in 1940. Details of the 1939 work follow.

STATE HIGHWAY CONSTRUCTION IN 1939

	Mileage Completed to Nov. 30, 1939	Uncompleted Mileage on Dec. 1, 1939
Graded and drained earth	196.6	82 0
Gravel and stone, untreated	171.2	75.9
Bituminous surface treatment	164.2	41.9
Bituminous mixed surface	20.2	6.8
Portland cement concrete	23.6	15.9
Bridges (number)	73	43
Grade separations (number)	10	1

The construction program for 1940 has not been definitely completed. However, all indications are that the commission will do the usual amount of paving work (probably 20 or 30 miles) as well as the usual amount of grading and other types of surfacing. There is a good possibility that there will be considerable stabilized base and armor coat work done this coming year; however, it is not possible to say at this time just how much will be included in next year's program. The commission will probably build 60 or 70 bridges which include a considerable number of the multiple-box type.

SOUTH ATLANTIC STATES

Delaware

State highway expenditures in 1939 included $1,400,000 for construction and $1,000,000 for maintenance. The probable amount available for state highway construction in 1940 is $1,250,000.

Details of the 1939 work and the probable construction program for 1940 are show in the tabulation.

STATE HIGHWAY CONSTRUCTION IN 1939

	Mileage Completed During 1939	Uncompleted Mileage Carried Over to 1940
Graded and drained earth	10	3
Sand-clay, treated	9.9	..
Gravel, untreated	8.7	..
Gravel, treated	105.3	..
Waterbound macadam, treated	96.7	..
Low-cost bituminous mix	3.0	..
Bituminous concrete	9.7	..
Portland cement concrete	24.6	4
Bridges (number)	3	1
Grade separations (number)	2	1

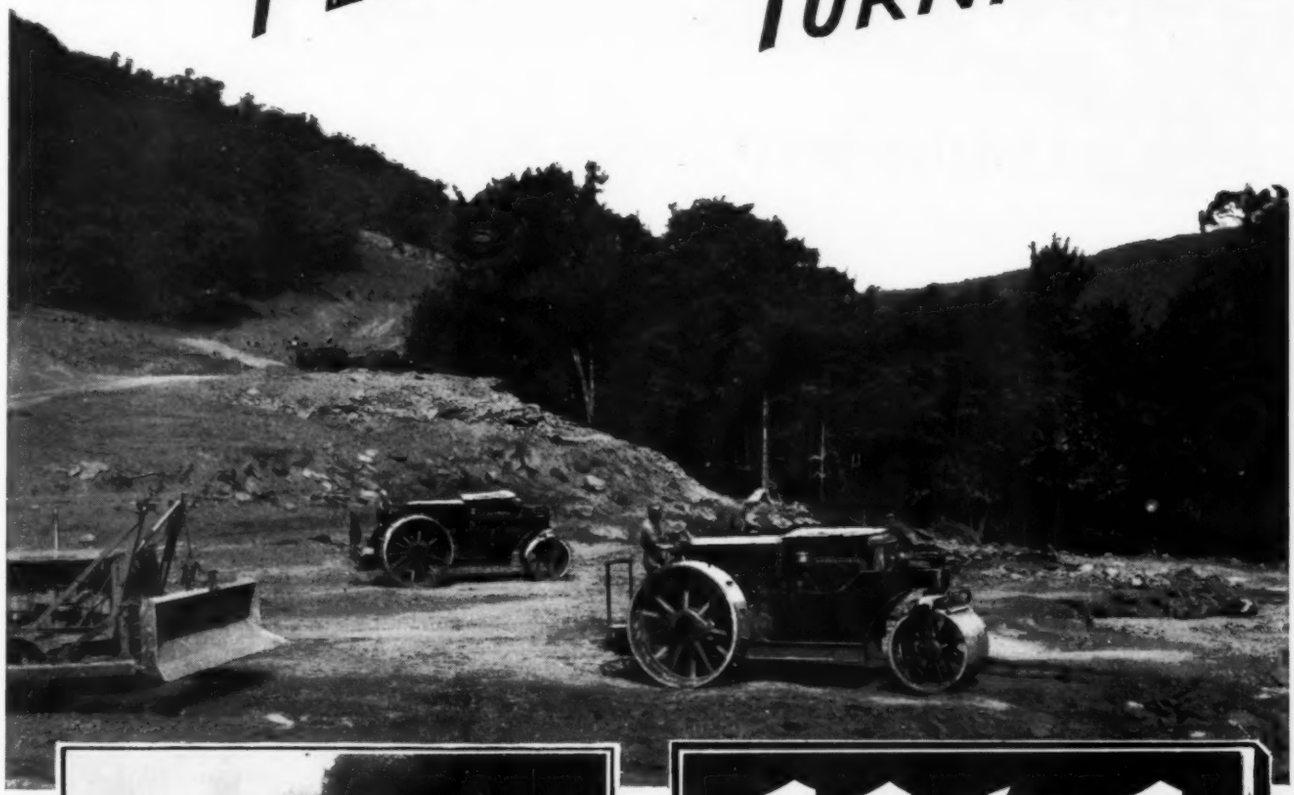
PROBABLE STATE HIGHWAY CONSTRUCTION IN 1940

	Miles
Graded and drained earth	10
Gravel, untreated	50
Gravel, treated	150
Waterbound macadam, treated	35
Low-cost bituminous mix	15
Bituminous concrete (retread)	20
Portland cement concrete (divided)	8
Portland cement concrete, widening	20
Bridges (number) ($200,000)	4
Grade separations (number) ($150,000)	2

Maryland

Details of state highway construction for 1939 and the probable construction program for 1940 follow:

ON THE PENNSYLVANIA TURNPIKE



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Buffalo-Springfield

STATE HIGHWAY CONSTRUCTION IN 1939

	Mileage Completed During 1939	Uncompleted Mileage Carried Over to 1940
Graded and drained earth	17.19	10.45
Gravel, untreated	13.89	3.19
Low-cost bituminous mix	43.16	8.30
Bituminous macadam	13.81	3.79
Bituminous concrete	....	0.82
Portland cement concrete	41.76	17.00
Bridges (number)	22	....
Grade separations (number)	6	....

PROBABLE STATE HIGHWAY CONSTRUCTION IN 1940

	Miles
Gravel, untreated	14.75
Low-cost bituminous mix	12.39
Bituminous macadam	10.02
Portland cement concrete	48.47
Bridges (number)	25
Grade separations (number)	11

State highway expenditures in 1939 include $9,124,304 for construction and $2,834,691 for maintenance. The probable amount available for state highway construction in 1940 is $15,205,564.

West Virginia

The actual expenditures for construction under the direction of the state road commission in 1940, including projects carried over to that year, will approximate the 1939 construction expenditure, which was $10,000,000.

The following is a tentative schedule of the mileage completed as follows:

MILEAGE COMPLETED—1939

Types	Primary	Secondary
Grade, drain	21.424	10.772
Gr., dr., base	10 833	84.357
Bit. surface	400.640	416.469
Gr., dr., bas., bit. surf	63 531	80.431
Gr., dr., untrtd. surface	19.975	2.949
Gr., dr., concrete	28.238	.....
Base, bit. surface	68.152	140 804
Bit. stab., surf. treat	19.354	13.500
Concrete	7.477	0.340
Mulch (gravel, shale)	.....	45.550
Base	39.545	1.300
Total, all types	679.169	796.472
Guard rail	48.231	0.369
Bridges	31	16

Virginia

The estimated expenditures for the year 1939 are as follows:

PRIMARY STATE HIGHWAY SYSTEM

Approximately 461 miles of Primary Roads graded, surfaced and widened at a net cost of about	$11,330,000
146 miles yet to be graded and surfaced, to be carried over as non-completed construction projects into the next calendar year at an estimated cost of	3,200,000
Ordinary Maintenance, approx.	2,300,000
Resurfacing, Replacement and Improvements, approx.	2,700,000
240 miles of maintenance plant-mix or bituminous concrete surfacing placed by contract at a cost of approx.	846,000

SECONDARY HIGHWAY SYSTEM
(Former County Roads Prior to 1932)

Ordinary Maintenance, approximately	2,700,000
Construction, Resurfacing and Improvement, approx.	4,320,000

At the present time there are 9,377 miles of road in the primary system in this state. The secondary roads, with a mileage of 36,682 miles, are maintained and improved by the maintenance department.

Estimated revenues and receipts, including Federal Aid, available for expenditure on primary state highway system, $15,132,000, and secondary highway system, $7,762,000, during fiscal year July 1, 1940, to June 30, 1941, $22,892,000 net (for actual construction, maintenance and improvements).

PRIMARY STATE HIGHWAY CONSTRUCTION, 1939 AND 1940

	Mileage Completed During Calendar Year 1939	Incompleted Mileage Carried Over to Year 1940	Probable New Construction During 1940
Graded, and drained	11.017	0.000	5.00
Gravel, soil, untreated	27.160	14.220	...
Gravel, soil, treated	82.741	19 057	100.00
Macadam, untreated	42.988	14.570	...
Macadam, Bit. surf.	202.718	56.742	240.00
P. C. concrete	10.236	17.411	10.00
Sheet asphalt and Bit. concrete	0.470	0.000	10.00
Bridges and separation structures (number)	(70)	(17)	(17,000 L.F.) (80)
Sub-total exclusive of widening	377.330	122.000	365.
Widening			
Macadam, Bit. surf.	4.739	14.180	15.00
P. C. concrete	43.637	4.531	75 00
Sheet asphalt and Bit. concrete	35 581	6.150	40.00
Bridges (number)	(9)	(2)	(2,700 L.F.) (20)
	461. (79)	147. (19)	485. (100)

In addition to new construction itemized under primary system, there were surfaced with bituminous concrete, out of funds allocated to improvement, resurfacing and replacement, supervised by the maintenance department, a total of 240 miles at a cost of $846,000.

It is expected that at least an equal mileage will be surfaced in this manner during 1940.

North Carolina

State highway expenditures in 1939 for construction amounted to $15,430,000; for maintenance, $12,300,000. The probable amount available for state highway construction in 1940 is $13,500,000.

The following tables show state highway construction last year and the probable mileage to be constructed this year:

STATE HIGHWAY CONSTRUCTION IN 1939

	Mileage Completed During 1939	Uncompleted Mileage Carried Over to 1940
Graded and drained earth	665	250
Sand-clay, gravel and untreated	495	90
Macadam, traffic bound	450	85
Bituminous, surface treatment	575	165
Sand, asphalt widening	40	...
Portland cement concrete	100	25
Portland cement concrete, widening	110	50
Sand-asphalt	130	20
Bridges (number)	89	19
Grade separations (number)	16	4

PROBABLE STATE HIGHWAY CONSTRUCTION IN 1940

	Miles
Graded and drained earth	325
Sand-clay and gravel, untreated	115
Macadam, traffic bound	70
Bituminous surface treatment	180
Portland cement concrete	80
Portland cement concrete, widening	110
Sand-asphalt	65
Bridges (number)	35
Grade separations (number)	15

Note: A total of 325 miles of new roads are now under construction. In all, 2,012 miles of new roads were completed in 1939 and 540 miles of new roads are expected to be built in 1940. The above mileage by types of roads under construction, completed and expected to be built

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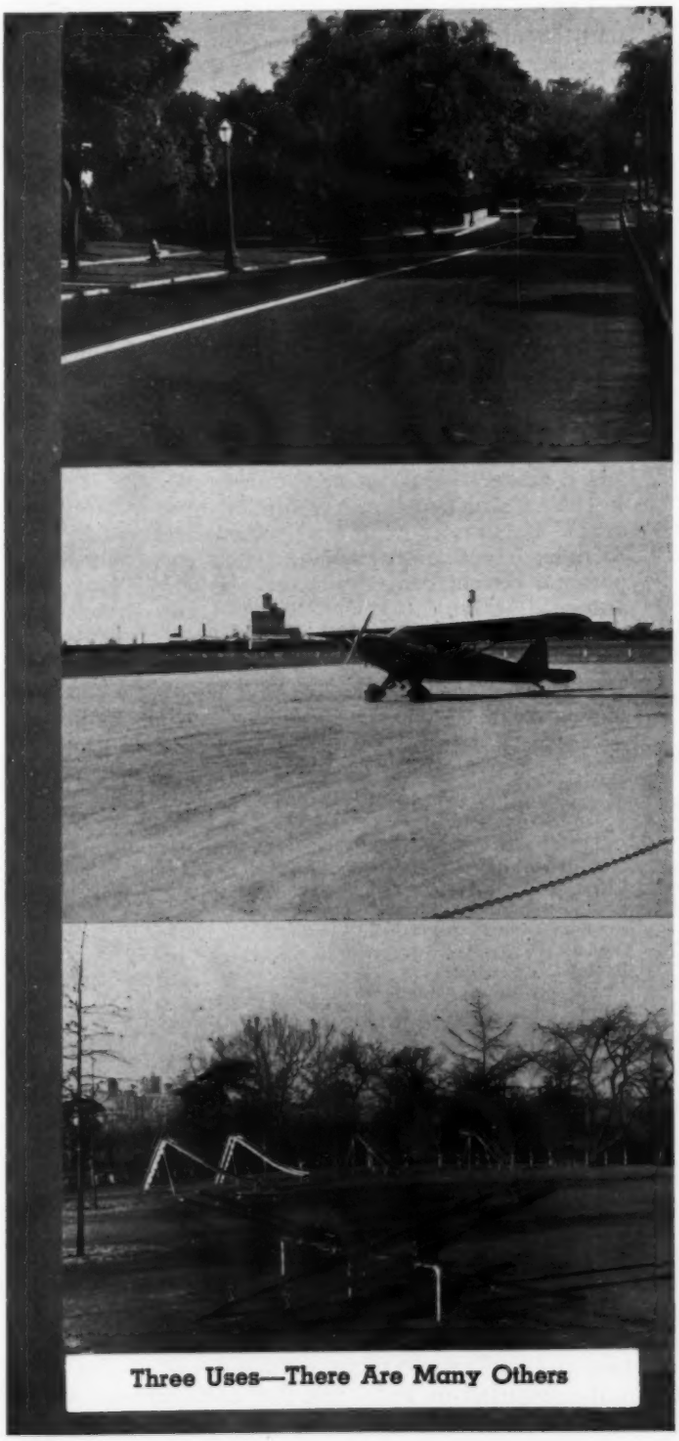

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Laboratory
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show a repetition of miles of new roads due to the fact that there are cases where two or three types of construction will be used on stretches of new roads under construction and expected to be built in 1940 and where two or three types of construction were used on new roads completed.

South Carolina

During the first part of 1939 South Carolina's road building program was inactive as far as new contracts were concerned. Legislation threatening diversion of gasoline tax funds jeopardized the certainty of funds which would be available for such contracts. However, the state legislature adjourned in June without seriously affecting the highway department's funds and since June new state highway contracts, aggregating approximately $3,000,000, have been let.

A large part of the work on these contracts will be carried over into 1940 and it is expected that additional work will be put under contract just as fast as funds become available.

According to the present outlook, the highway department will be able to finance new highway contracts aggregating between $6,000,000 and $7,000,000 in 1940. This work will include about 300 miles of new bituminous surface roads, concrete and bituminous widening work, bridges, and about 10 miles of concrete pavement on dual lane roads, grade separation projects, etc.

During the calendar year 1939 the construction expenditures of the department amounted to approximately $8,000,000, the large part of which work was let to contract in 1938. Six major projects were included in work carried on in 1939, including three interstate bridges. Substantial progress was made on the dual lane highway between Spartanburg and Greenville; several sections of main highways were widened and about 300 miles of new roads constructed. Also, the department widened and improved the highways through a large number of towns in the state.

The state highway system on June 30, 1939, embraced about 7,500 miles, of which over 6,000 miles were hard surfaced. The total construction investment expenditure in the state highway system on June 30th was $142,506,000 and the funded debt of the department on that date was $59,667,866.80.

Expenditure for maintenance purposes during the fiscal year ending June 30, 1939, were as follows:

Direct maintenance costs	$1,452,247
Supervision	57,058
Retreatments	595,127
Shoulder treatment	458,652
Special maintenance work	20,006
Purchase of new equipment	380,027
Total	$2,963,120

Georgia

During 1939 there were completed under the direction of the state highway department 600 miles of graded and drained earth road, 40 miles of portland cement concrete, 370 miles of asphalt construction including surface treatment, 50 bridges and 12 grade separations.

The state highway construction program for 1940 includes the following:

	Miles
Graded and drained earth	600
Portland cement concrete	50
Asphalt, including surface treatment	400
Bridges (number)	50
Grade separations (number)	25

In 1939 the state highway expenditures included $12,406,000 for construction and $3,500,000 for maintenance. The probable amount available for state highway construction in 1940 is $12,500,000.

Florida

State highway expenditures last year included $13,182,982 for construction and $3,444,210 for maintenance. Types and their mileage of the 1939 work follow:

STATE HIGHWAY CONSTRUCTION IN 1939

	Mileage Completed During 1939
Graded and drained earth	120.00
Sand-clay, untreated	21.74
Sand-clay, treated	84.22
Low-cost bituminous mix	82.84
Portland cement concrete	19.20
Rock base, surface treated	66.16
Bridges (number)	41
Grade separation (number)	4

The department's budget for 1940 will not be adopted until about March 1, 1940, and consequently it is impossible, before that date, to give information relative to the work for 1940.

EAST SOUTH CENTRAL STATES

Kentucky

For 1939 state highway expenditures included $9,300,000 for construction and $5,083,000 for maintenance. It is expected $9,000,000 will be available for state highway construction in 1940.

State highway construction last year included 27.5 miles of graded and drained earth, sand-clay treated and untreated and gravel untreated; 79 miles of treated gravel, waterbound macadam, treated and untreated, low cost bituminous mix and bituminous macadam; 74 miles of bituminous concrete, portland cement concrete, brick and asphalt. In addition 12 separate contracts for bridge and 8 grade separations were completed.

The construction program for 1940 includes 38 miles graded and drained earth road, 62 miles untreated gravel, 85 miles bituminous macadam, bituminous concrete and portland cement concrete, 15 bridges and 8 grade separations.

Alabama

Up to Sept. 30 700 miles of graded and drained earth road had been completed and 650 miles of low cost bituminous mix. Further details of the 1939 work follow.

STATE HIGHWAY CONSTRUCTION AS OF SEPTEMBER 30, 1939

	Mileage Completed During 1939	Uncompleted Mileage Carried Over to 1940
Graded and drained earth	700	400
Chert, gravel and sand-clay, untreated	100	50
Low-cost bituminous mix	650	250
Portland cement concrete	1.65	0
Asphalt	1.41	...
Bridges	5	4.33
Grade separations (number)	7	15

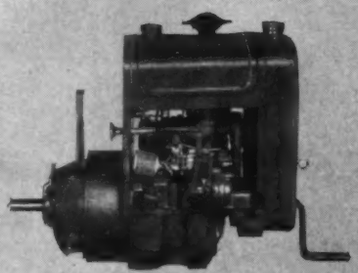
The construction program for 1940 calls for 500 miles of graded and drained earth road, 500 miles of low cost bituminous mix, 50 miles of chert, gravel and sand-clay (untreated), 7.5 miles of portland cement concrete; also 4 bridges and 15 grade separation projects.

State highway expenditures in 1939 included $11,300,000 for construction and $2,000,000 for maintenance. It is probable $11,300,000 will be available for state highway construction in 1940.

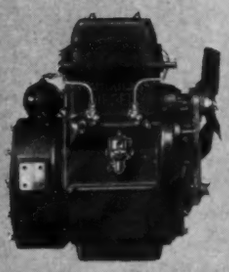
Mississippi

State highway expenditures in 1939 included $23,429,000 for construction and $1,708,000 for maintenance. Probable amount available for state highway construction in 1940 is $12,000,000. The mileage of state highway completed in 1939, and the work carried over to 1940, are shown below.

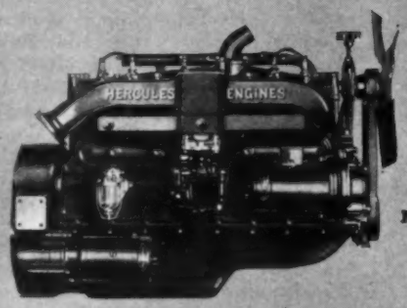
HERCULES
Gasoline and Diesel
ENGINES



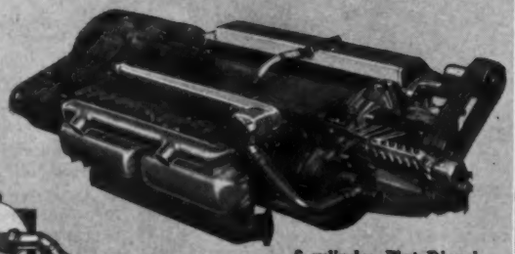
2-cylinder Gasoline
MODEL BXB, 2-7/8"x3"



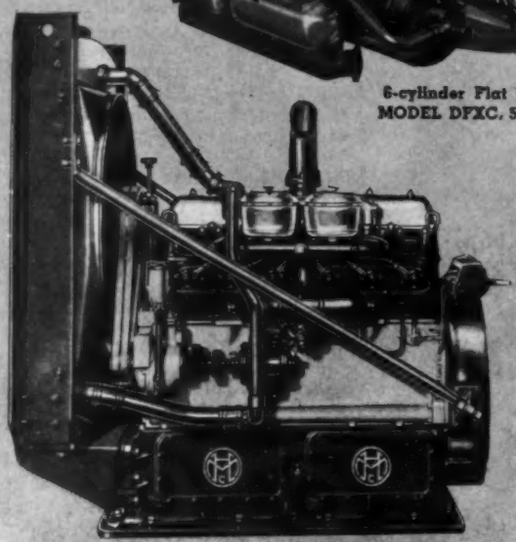
2-cylinder Diesel
MODEL DJXC, 4"x4½"



6-cylinder
Gasoline
MODEL JXD,
4"x4¼"



6-cylinder Flat Diesel
MODEL DFXC, 5¼"x6"



6-cylinder Diesel, MODEL DHXB, 5"x6"

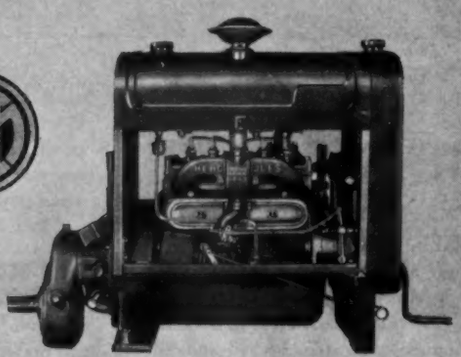
AS new and better road building and road maintenance methods are developed, the modern internal-combustion engine becomes an increasingly important factor. And this year, as they have in the past, Hercules engines will be shown in a wide and varied range of power-operated machines.

Because of the rugged reliability of all Hercules models — and because of the wide range of sizes offered in performance-proven, high-speed, heavy-duty engines and power units — Hercules consistently maintains its leadership.

For many years at the Road Show, a major percentage of manufacturers displaying equipment powered with internal-combustion engines, within the wide range of Hercules sizes, have shown Hercules engine applications. Highway officials and road contractors show clearly, in their annual purchases of millions of dollars worth of road building equipment, their preference for Hercules power.

Specify Hercules Engines in the equipment you buy — for dependable performance and bed-rock economy of operation.

HERCULES MOTORS CORPORATION
CANTON, OHIO, U. S. A.



6-cylinder Gasoline, MODEL IXB, 3¼"x4"

a faster SMOOTH DIESEL

YOU'VE NEVER SEEN ANYTHING LIKE IT. Never before a tractor with 108 Drawbar h.p. . . . and with speeds up to 7 m.p.h. POWER . . . FLEXIBILITY . . . SPEED . . . in a combination never before possible in a crawler tractor.

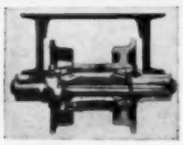
A 2-cycle Diesel engine free of the handicaps of ordinary Diesels . . . field tested under every conceivable soil and climatic condition. On long continuous operations . . . we gave it the works . . . tried to break it down. It met every gruelling test on every job . . . as it will on yours. You'll be as proud of it as we are. Try it . . . see for yourself. Ask your Allis-Chalmers dealer to show you what it can do . . . on your job.

PROVED BY OVER 1,000,000 CU. YDS. OF MUD, SAND AND ROCK—R. W. Briggs, Pharr, Texas, operated six of these new tractors day and night in the hot Rio Grande Valley, moving 1,059,000 cu. yds. of mud and sand . . . Herman Holmes worked double shifts with five in rock and shale on the Pennsylvania Turnpike at Bedford, Pennsylvania . . . others worked long hours for: Harper Bros. Logging Co., Missoula, Montana; Crossett & Western Lumber Co., Knappa, Oregon; Henry Raemisch, Springfield Corners, Wisconsin; Kiker & Yount, Reidsville, North Carolina; Haddock Bros., Visalia, California. These tractors, in this diversified service, have proved themselves to be the easiest starting, fastest-moving track-type Diesel tractors in the world today.

FIVE EXCLUSIVE MONEY-MAKING FEATURES

1. **HIGH WORKING SPEEDS**—cut round trip time and lengthen profitable haul distances.
2. **POSITIVE-SEAL TRUCK WHEEL ASSEMBLY**—requires lubrication only once in 200 hours.
3. **NEW "LONG-WEAR" BRAKES**—greatly reduce time-out for repairs.
4. **NEW "LONG-WEAR" STEERING CLUTCHES**—outlast ordinary clutches by several hundred hours.
5. **GENERAL MOTORS 2-CYCLE DIESEL ENGINE**—proved by 25,000,000 miles of heavy-duty railroad service.

LUBRICATE TRACKS ONLY ONCE IN 200 HOURS—With the Positive-Seal truck wheel assembly you need lubricate track rollers and idlers *only once in 200 hours.* You save up to 90% on roller and idler lubrication, gain many extra operating hours on greasing time, greatly prolong track life.



LONG-WEAR STEERING CLUTCHES AND BRAKES—In the hardest service . . . night and day operation . . . blistering heat . . . sub-zero temperatures . . . the new LONG-WEAR bimetallic steering clutches and brakes were developed to give you hundreds of hours of extra service. Gruelling tests prove they will greatly outlast ordinary clutches and brakes.

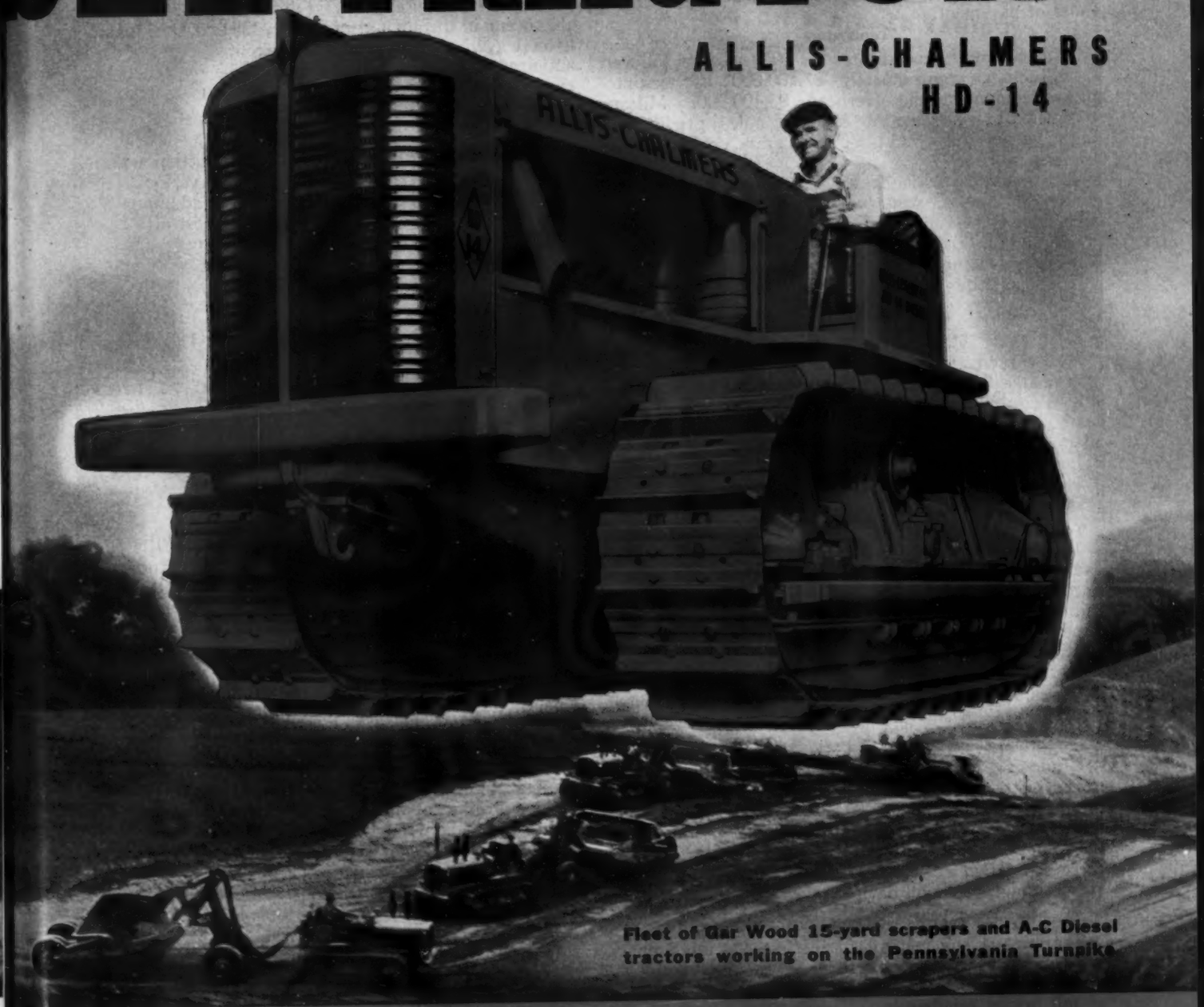
COMPLETELY EQUIPPED—NO EXTRAS TO BUY—Standard equipment includes electric starter and lights, muffler, radiator guard, crankcase guard, front pull hook, bumper, hour-meter, radiator shutters, fenders and heavy truck wheel guards. It's a complete tractor, ready to go to work . . . on your job NOW.

SIMPLIFIED, POWER-PACKED DIESEL ENGINE—Proved by 25,000,000 miles of service in America's crack streamliners, General Motors 2-cycle Diesel . . . doubles power impulses . . . steps up horsepower per pound of weight . . . gives you operating simplicity and freedom from repair seldom matched. Smooth-running, it responds to the throttle with flashing pick-up, yet hangs on with the tenacity of steam power.

SPLIT-SECOND ELECTRIC STARTING—Starts right now! No fuss, no bother . . . press the button—it goes to work!

...HER...MORE POWERFUL
...SEL TRACTOR

ALLIS-CHALMERS
HD-14



Fleet of Gar Wood 15-yard scrapers and A-C Diesel tractors working on the Pennsylvania Turnpike

ALLIS-CHALMERS *Faster* DIESEL *Power*

TRACTOR DIVISION—MILWAUKEE, U.S.A.

STATE HIGHWAY CONSTRUCTION IN 1939

	Mileage Completed During 1939	Uncompleted Mileage Carried Over to 1940
Graded and drained earth	261.8	641.9
Gravel, untreated	....	27.1
Low-cost bituminous mix	28.1	264.2
Portland cement concrete	283.8	102.4
Asphalt (Hi-Type)	25.3	8.6
Asphalt (sand-asphalt)	60.3	54.1
Bridges (number)	115	271
O. H. grade separations (number)	6	5
U. P. grade separations (number)	None	7

The estimated construction program for 1940 calls for 150 miles of graded and drained earth road, and 600 miles of pavement.

Tennessee

State highway expenditures for 1939 were as follows: Construction, approximately $7,300,000; for maintenance, equipment and overhead, $3,400,000. Mileage completed by contract: Surfacing, 96 miles; grading and drainage, 108 miles; 20 bridge and grade crossing structures.

The minimum anticipated program for 1940 is as follows: For contract construction, $6,800,000; other construction, $3,000,000; for maintenance, equipment and overhead, $3,400,000. Contract construction: Surfacing, 70 miles; grading and drainage, 164 miles; bridges and grade seperations, 12 structures.

WEST SOUTH CENTRAL STATES

Arkansas

The construction program for the 1939 calendar year was financed with federal funds made available through toll bridge reimbursement accomplished by action of the state in freeing all state-owned and operated toll bridges in the spring of 1938. The funds involved were in the following amounts:

Regular Federal Aid	$1,702,000
Secondary Federal Aid	254,000
Total	$1,956,000

In addition thereto, Forest Highway Funds were made available in the amount of $73,000, and carry over balances accrued sufficient in amount to allow contract commitments to be made in the total of $2,683,136. Those funds provided for work of the following general classification, grading and minor drainage structures being a necessary appurtenance to many of the projects involved.

Pavement, high type	18 miles
Bituminous surfacing, road mix or equivalent	85 miles
Untreated gravel surfacing	64 miles
Major bridges	3,748 lin. ft.

Grade crossing separation and protection funds apportioned to the state from federal sources, and not requiring matching, amounted to $344,000. This sum, together with accrued balances allowed contract commitments in the total of $723,139, thus financing the construction of three separation structures, two relocation projects and six crossing protection devices.

Proposed 1940 Construction Program

Tentative arrangements being perfected at this time for a construction program for the 1940 calendar year contemplate the utilization of federal funds through the form of toll bridge reimbursement made eligible through the state freeing all state-owned and operated toll bridges in the spring of 1938. The funds involved are in the following amounts:

Regular Federal Aid	$1,970,000
Secondary Federal Aid	254,000
Total	$2,224,000

In addition thereto, carry over balances will probably accrue in the approximate amount of $500,000, making a total available of about $2,750,000. It is anticipated these funds will be used to finance work of the following general classification, grading and minor drainage structures being a necessary appurtenance to many of the projects involved.

Pavement, high type	15 miles
Bituminous surfacing, road mix or equivalent	115 miles
Untreated gravel surfacing	10 miles
Major bridges	3,000 lin. ft.

Grade crossing separation and protection funds apportioned to Arkansas from federal sources, and not requiring matching, for the 1941 fiscal year beginning July 1, 1940, approximate $520,000. In addition, a carry over of balances from previous year apportionments will probably occur in the amount of about $225,000, thus making a total available for contract of about $750,000. It is anticipated that this sum will finance the construction of eight separation structures, one relocation project and several signal installations.

Louisiana

A total of 730 contract miles of construction with an aggregate cost of some $24,000,000 was in various stages of improvement during the year, and an additional 735 miles of construction with an estimated cost of $2,718,000 was undertaken with commission forces. The following tabulation gives some details of the work:

STATE HIGHWAY CONSTRUCTION FOR 1939 AND 1940

	Completed 1939		Forward to 1940		New Work 1940	
Conc.	43	$2,056,000	50	$2,163,000	140.9	$6,557,328
S.T.	33	425,000	..	.....	....	.....
Gravel	230	1,984,000	238	1,837,000	56.9	655,559
Grading	25	628,000	87	1,351,000	37.2	1,149,367
Bridges	7	5,961,000	5	6,469,000	....	6,211,000
Gd. Sep.	1	507,000	2	906,000	....	306,194
Rdsd. Imp.	3	13,000	4	50,000	12.4	107,329
	342	11,574,000	386	12,776,000	251.4	14,986,779
Maint.Const.	542	2,338,111	193	379,889		
	884	13,912,111	579	13,155,889		

The value of work carried forward to 1940 is $13,155,000 and the funds available for new construction in 1940 amount to $14,986,000, of which 6,000,000 was made available by the United States Government for the construction of bridges in the floodway area.

The principal features of the 1940 program will be the completion of the superstructure and the paving of the approaches to the Mississippi River Bridge at Baton Rouge; the widening of the Airline Highway between Bonnet Carre Spillway and Kenner; the completion of the Airline Highway between LaBarre and Carrollton streets in New Orleans; the paving of the approaches to the new Red River bridge at Alexandria; the completion of the embankments on Route 8 between Shreveport and Caddo Lake; between Boutte and the Mississippi River bridge at New Orleans; between Lee and Micheaud; the construction of numerous bridges and railroad grade separations; the construction of approximtaely 140 miles of concrete pavement and approximately 95 miles of secondary roads.

Oklahoma

State highway construction in 1939 included 930 miles, various types, at an approximate cost of $8,840,000. It is estimated that $12,000,000 will be expended on 1940 construction, the work including pavements, grading and drainage, major bridges and grade separations.

Texas

The following is a resume of the operation of the state highway department for the fiscal year ended Aug. 31, 1939.

AUTOMATIC CONTROL FOR MEASURING BITUMINOUS CEMENT

NON-MANUAL - RESETS AUTOMATICALLY

Visit the Road Show in Chicago, and witness a demonstration of the FLUIDOMETER SYSTEM at the exhibit of Hetherington & Berner, Inc. of Indianapolis, Indiana, Distributors.

The FLUIDOMETER SYSTEM is a simple, dependable, completely non-manual metering system which eliminates false tare, human errors, injury, and occupational disease hazards incidental to the handling of hot bituminous cement.

The FLUIDOMETER SYSTEM is adaptable to all types of bituminous pavement mixing plants . . . whether the operations be manual, semi-automatic, or fully automatic. We invite your inquiries on adapting the FLUIDOMETER SYSTEM to your plant.

The precise accuracy and simple operation of the "Brass Brain", (control unit), accomplishes important savings in TIME, LABOR and MONEY. Paving mixtures are held to exact limits of uniformity. With the FLUIDOMETER SYSTEM, costly variation is eliminated. (No fat spots).

BRAYER INSTRUMENT COMPANY

1615 William Street ★ *Buffalo, New York*

In this year 786 construction projects totaling $31,321,706.71 were placed under contract and were composed of:

Type	Mileage	Cost
Grading and small structures	385.50	$ 4,186,105
Gravel, caliche, etc., surface	750.64	7,003,851
Asphalt surface	1,230 67	8,961,932
Concrete and brick	113 97	3,908,642
Highway protecting devices	.....	6,120
Highway planning survey	.....	287,219
Landscape projects	.....	420,855
Total highways	2,480.78	$24,774,726
Large bridges	.....	$ 3,990,619
Underpasses and overpasses	.....	2,556,360
Total	.....	$ 6,546,980

During the fiscal year 891 projects including 70 large bridges and 10 grade separations were completed. The detail by type is:

Type	Mileage	Cost
Grading and small structures	753.99	$ 7,533,344
Gravel, caliche, etc., surface	1,185.14	8,714,079
Asphalt surface	1,152.04	8,364,317
Concrete and brick	188 23	5,108,504
Railroad relocation	1.88	51,991
Highway protection devices	.....	256,759
Landscape projects	.....	217,423
Total highways	3,281.28	$30,246,420
Large bridges	.....	3,776,406
Underpasses and overpasses	.....	904,824
Total	.....	$ 4,681,230

On Aug. 31, 1939, there were 514 projects, including 40 large bridges and 18 grade separations, under construction and active, though part of the cost shown had been paid on estimates prior to to Aug. 31st:

Type	Mileage	Cost
Grading and small structures	409.36	$ 3,824,600
Gravel, caliche, etc., surface	542.14	5,132,109
Asphalt surface	673.75	4,988,468
Concrete and brick	67.69	2,316,838
Highway protecting devices	.....	6,165
Highway planning survey	.....	1,669,973
Landscape projects	.....	274,629
Total highways	1,692.94	$18,212,785
Large bridges	.....	6,745,979
Underpasses and overpasses	.....	2,356,860
Total	.....	9,102,840

On Sept. 1, 1939, there were $24,638,000 Federal and state funds authorized for construction and not yet placed under contract, and, in addition, the maintenance budget for the present fiscal year amounted to $8,562,000.

MOUNTAIN STATES

Montana

A total of $6,200,000 was expended on state highway construction in 1939, and $2,100,000 on maintenance. Probable funds available for state highway construction in 1940 total $5,100,000. Details of the 1939 and 1940 work follow.

STATE HIGHWAY CONSTRUCTION IN 1939

	Mileage Completed During 1939	Uncompleted Mileage Carried Over to 1940
Graded and drained earth	66	53
Gravel, untreated	78	48
Low-cost bituminous mix	62	69
Bridges (number)	123	13
Grade separations (number)	3	2

PROBABLE STATE HIGHWAY CONSTRUCTION IN 1940

	Miles
Gravel, untreated	140
Low-cost bituminous mix	200
Bridges (number)	100
Grade separations (number)	2

Idaho

A total of 18 contracts of an estimated cost of $1,913,406 contracted in 1938 were completed in 1939. In addition 23 contracts of an estimated cost of $1,232,423 let in 1939 were completed that year. Details of the work follow:

CONTRACTED IN 1938, COMPLETED 1939

Total cost estimated (18 contracts)	$1,913,406
Grade, drain and crushed rock or crushed gravel surfacing	37.429 miles
Crushed rock or crushed gravel surfacing	22.322 miles
Road mix bituminous surfacing	23.785 miles
Timber bridge—1	146 lin. ft.
Steel and timber bridges—4	2,065 lin. ft.
Steel and concrete overheads—2	459 lin. ft.
Interstate bridge	1,424 lin. ft.
Grade and drain	6.099 miles

NOT COMPLETED DECEMBER 8, 1939

Total cost estimated (21 contracts)	$1,480,177
Grade, drain and crushed rock or crushed gravel surfacing	70 820 miles
Crushed gravel surfacing	18 869 miles
Surface treatment	7.232 miles
Plant mix biutminous surfacing	3.980 miles
Road mix bituminous surfacing	27.005 miles
Concrete overhead	276.5 lin. ft.
3 timber bridges—total length	184 lin. ft.
6 concrete bridges—total length	330 lin. ft.
Retaining wall concrete	1,925 lin. ft.
Sidewalk concrete	706 sq. yds.
1 concrete arch	26 lin. ft.

CONTRACTED AND COMPLETED 1939

Total cost estimated (23 contracts)	$1,232,423
Grade, drain and crushed rock or crushed gravel surfacing	34.956 miles
Crushed gravel surfacing	14.070 miles
Crushed gravel leveling course	7 400 miles
Plant mix bituminous surfacing	17.011 miles
Road mix bituminous surfacing	75.159 miles
Seal coating—only	62.492 miles
4 lane P. C. concrete pavement	3,262 miles
Roadside improvement	43.045 miles
Sprinkling system (R. S. Imp)	1.476 miles
6-in. sewer	684 lin. ft.
Concrete bridges—7	424 lin. ft.
Curbs	260 lin. ft.
Sidewalks	130 sq.yds.

It is estimated that $3,900,000 was spent for state highway construction in 1939; $1,688,000 was expended for maintenance. The probable available funds for state construction in 1939 are $4,022,000. The construction program is not available at this time.

Wyoming

During 1939 Wyoming completed a $3,700,000 construction program, involving 130 miles of grading and approximately 400 miles of oiling of various types. There are approximately 3,900 miles on the state highway system, all of which—with the exception of about 400 miles—are oiled. During 1939 the oiled mileage was increased by 370 miles. A considerable portion of the mileage oiled was of the light penetration type. The rest was 1½ to 2 in. mats road mixed, the later type being used on the heavier traveled roads.

The total mileage of state highways has been increased by some 97 miles. Practically all of this increase is due to the department taking into the system secondary or feeder roads which are being completed or have been completed to an oiled standard by the department.

The highway department expects to carry on practi-

IT'S AT THE ROAD SHOW! THE Ozalid WHITEPRINT PROCESS — BOOTH T-11

HERE'S a chance to see in action the positive-printing, dry-developing reproduction process which is rapidly replacing blueprinting and other photo-copy methods. Ozalid Whiteprints will be made at the amazing speed of 20 feet per minute. You can see transparent duplicates of original drawings made in a few minutes in the same simple manner that standard Ozalid Whiteprints are produced.

OZALID transparent materials provide numerous short-cuts in drafting. See how simple it is to make a transparent duplicate of an original drawing with changes without altering the original.

The OZALID process is simple and quick. There is no washing or fixing and no time lost in waiting for prints to dry. Finished prints emerge from the Ozalid machine dry and ready for use.

OZALID Whiteprint machines incorporate both exposing and developing equipment in one compact unit. They do a complete job of print making.

OZALID dry-developing machines are available for those who already have a printer or blueprinting equipment for use as an exposing medium.

A SELECTION of Ozalid Whiteprint and developing machines capable of meeting all print room requirements will be on display at our Road Show Exhibit. Come in to see us at Booth T-11.

If you are unable to attend the Road Show, write us today for complete details on the Ozalid process and free booklet of printed samples of Ozalid materials.

SEE THE NEW HIGH-SPEED MODEL "A" WHITEPRINT MACHINE

THE performance of this new High-Speed Automatic Whiteprint machine will amaze you. It is equipped with a revolutionary light source which provides printing speeds up to 20 linear feet per minute. Printing is syncronized with dry-development so that print production is continuous.

REVOLVING contact assures greatest light efficiency and provides perfect contact without smudging. Another unique feature is the automatic separation of print from original, in which the original is automatically returned to the operator in front of the machine while the exposed print is carried through the developer to be discharged from the rear of the machine. This makes possible the use of either cut sheets or continuous yardage.

OZALID CORPORATION

FACTORY and GENERAL OFFICE · ANSCO ROAD, JOHNSON CITY, NEW YORK

cally the same program with the same amount of funds available during the year 1940. The available funds being $4,600,000, including maintenance and overhead. Two million of this will come from Federal aid funds which are expected to be made available shortly after the first of the year. The gasoline tax will provide $1,800,000. Vehicle license fees and other state income will provide $800,000. It is expected that Federal funds will be $326,000 above last year's. However, the department is up to date on its matching of Federal funds, whereas last year they were some $500,000 behind.

Additional funds of over $100,000 for construction are included in the figures given above for last year's work, over and above what was anticipated. This is due to savings made in the reorganization of the department in that maintenance and overhead expenses have been cut down from $1,000,000 expended in 1938 to $900,000 expended in 1939. As a result of these savings, and in catching up in placing Federal funds under way, the department is able to have just as large a construction program next year as it had this year, in spite of the fact that there was $850,000 carried over in funds available at the beginning of 1939.

In addition to the above amounts, at the close of the year there will be approximately $1,800,000 worth of uncompleted work on the 1939 program to be completed in 1940. This year's work will be divided between grading and oiling in the same manner as this year's work was handled; i. e., 130 miles of grading and 400 miles of oiling.

Colorado

Expenditures of state highway department in 1939 included $9,600,000 for construction and $1,500,000 for maintenance. The probable funds available for state highway construction in 1940 amount to $6,750,000. The following tables give some details of the 1939 and 1940 work:

STATE HIGHWAY CONSTRUCTION IN 1939

	Mileage Completed During 1939	Uncompleted Mileage Carried Over to 1940
Gravel, untreated	241	56
Low-cost bituminous mix	630	..
Bridges (number)	90	30
Grade separations (number)	8	..

PROBABLE STATE HIGHWAY CONSTRUCTION IN 1940

	Miles
Gravel, untreated	175
Low-cost bituminous mix	625
Bridges (number)	50
Grade separations (number)	8

Arizona

State highway expenditures in 1939 included $4,665,999 for construction and $1,180,548 for maintenance. The probable funds available for state highway construction in 1940 amount to $5,500,000. The tabulation gives some details of the 1939 work.

STATE HIGHWAY CONSTRUCTION IN 1939

	Mileage Completed During 1939	Uncompleted Mileage Carried Over to 1940[1]
Graded and drained earth	28.9	2.0
Gravel, untreated	9	...
Low-cost bituminous mix	215	84 5
Portland cement concrete	9.2	5.3
Asphalt	3	...
Grade separations (number)	2	...
B. S. T.	...	6

Detail of the 1940 construction program have not been completed, but it will be approximately the same as in 1939.

New Mexico

State highway expenditures in 1939 included $5,086,000 for construction, and $1,463,000 for maintenance. The probable funds available for state highway construction in 1940 are $6,500,000. Details of the 1939 work and the probable construction program for 1940 are given in the tabulation:

STATE HIGHWAY CONSTRUCTION IN 1939

	Mileage Completed During 1939	Uncompleted Mileage Carried Over to 1940
Graded and drained earth	49.6	39.1
Gravel, untreated	229.0	107.5
Gravel, treated, single and double	96.1	206.9
Low-cost bituminous mix	125.4	....
Rock asphalt	47.1	26.1
Grade separations (number)	1*	....
Landscaping	3.2	1.9
Reprocessing	15 3	....

*3 eliminations.

PROBABLE STATE HIGHWAY CONSTRUCTION IN 1940*

	Miles
Graded and drained earth	70
Gravel, untreated	130
Gravel, treated or bituminous topping	200
Grade separations (number)	2

*Under contract or partly completed.

Mileages of the 1940 construction program are based on 1941 Federal Aid, Federal Aid secondary and grade crossing funds plus carry over of old funds, work not yet under construction. No estimate of state work alone for 1940 is available.

Utah

The approximate expenditure in 1939 for state highway construction was $4,500,000; for maintenance $1,250,000. For 1940 the probable funds available for state highway construction are $3,800,000. Details of the 1939 and 1940 work are shown in the tables.

STATE HIGHWAY CONSTRUCTION IN 1939

	Mileage Completed During 1939	Uncompleted Mileage Carried Over to 1940
Graded and drained earth	46	13
Gravel, untreated	129	33
Gravel, treated	14	..
Low-cost bituminous mix	199	36
Portland cement concrete	12	..
Asphalt	13	1
Bridges (number)	17	12
Grade separations (number)	2	..

PROBABLE STATE HIGHWAY CONSTRUCTION IN 1940

	Miles
Graded and drained earth	12
Gravel, untreated	36
Gravel, treated	17
Low-cost bituminous mix	105
Portland cement concrete	14
Asphalt	8
Bridges (number)	15
Grade separations (number)	2

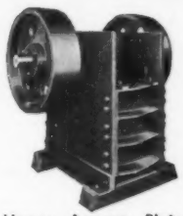
Nevada

During 1939 state highway expenditures were $2,800,000 for construction and $870,000 for maintenance. It is expected that $4,400,000 will be available from state highway construction in 1940.

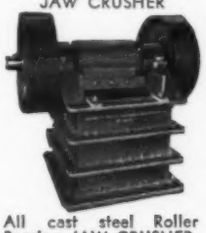
LOW COST ROCK CRUSHING FOR 55 YEARS

What are your Crushing Problems?

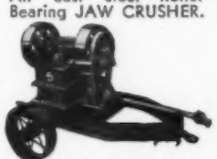
The GRUENDLER ORGANIZATION has your answer:



Heavy Armour Plate Steel Roller Bearing JAW CRUSHER



All cast steel Roller Bearing JAW CRUSHER.



Trailer Type Maintenance JAW CRUSHER with Universal Drive

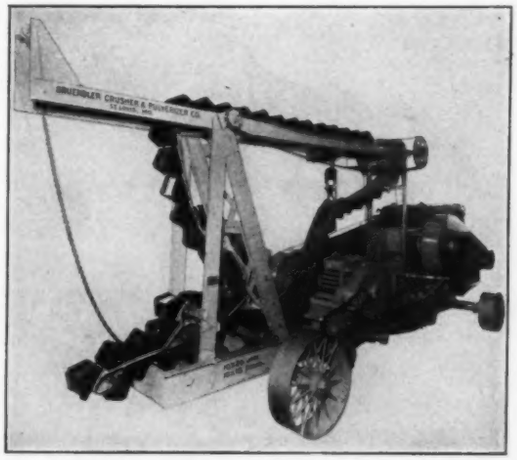
VIBRATOR SCREENS in all sizes.

Heavy Duty Revolving Screens up to 84 inch diameter

Jack Leg Steel Bins Manufactured in sizes 5-15, 21-30 and 35 ton capacities. Also stationary knocked down bins up to 100 tons capacity.

With all the skill, precision and experience gained in Manufacturing Reduction Equipment for 55 years, your particular requirements will be met considering every measure of Economy and Efficiency.

The Engineering Staff will gladly assist you in your Rock, Gravel and Sand crushing, sizing, conveying and storing problems. Plans will be furnished on any size stationary or Portable plant required. WRITE TODAY



Plant designed to do an Economical Crushing job (another GRUENDLER ENGINEERING DEMONSTRATION)

A new Combination Portable Plant — Both JAW CRUSHER and ROLL CRUSHER, all mounted on one frame.

For producing finer aggregate for black top this Combination Plant performs the work economically in one compact movable unit — whereas if several stationary units were built to do identical work, it would not be as economical.

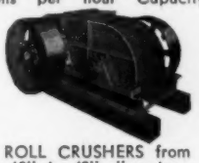
GRUENDLER

CRUSHERS - PULVERIZERS - GRINDERS

Offices in Principal Cities

Portable Crushing and Gravel Screening Plant. Capacity 60 yds. to 100 yds. per hr.

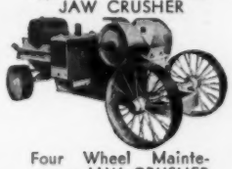
HAMMER CRUSHER From 1 ton per hour to 500 tons per hour Capacity.



ROLL CRUSHERS from 18" to 40" diameter.

Portable TWO-IN-ONE Hammer Mill for both Rock Crushing and Lime Pulverizing.

Self Traveling Tractor Operated Maintenance JAW CRUSHER



Four Wheel Maintenance JAW CRUSHER with Power Unit.

Four Wheel Crusher Power Unit and Conveyor

Write for Bulletins on Lower Crushing Costs

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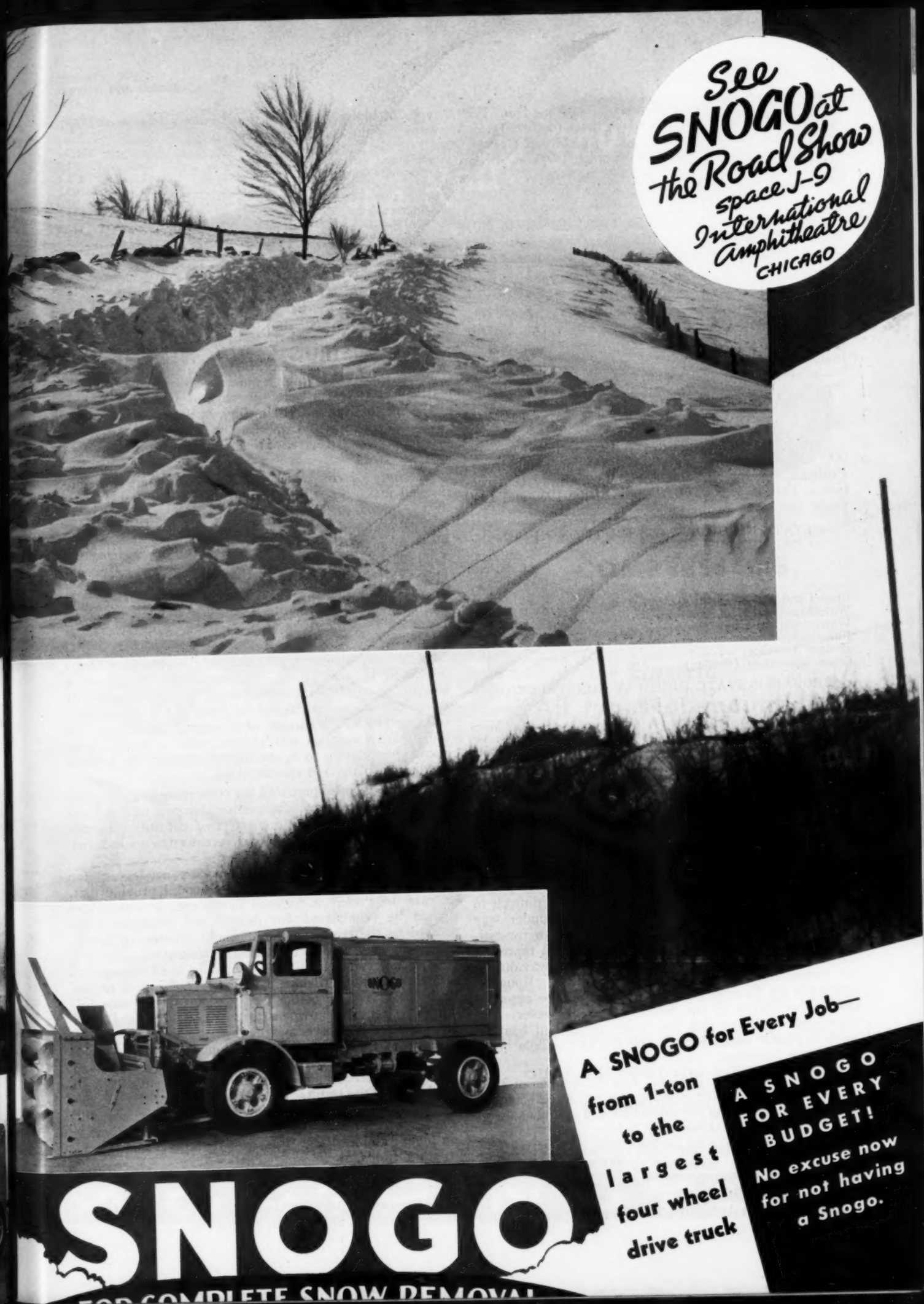
SNOGO
cuts out the high cost of
REPEAT PLOWING!

BANKS of snow along your roadsides cost you money. Winds drift them back over the road. *Repeat plowing* takes time, runs up gasoline, puts that much more wear and tear on the plow. Fresh snow narrows the road, piles the banks higher, reduces visibility on curves and adds danger to winter driving. Snogo cuts County and State highway maintenance costs. Snogo puts the snow off the road once and for all. Snogo eliminates *repeat plowing!* No banks build up into ever deepening, ever narrowing, dangerous lanes that call for continuous going over to push them back. Ditches are opened and can function normally carrying off surface water that damages road surface and shoulders.

Snogo means business as usual! Gas tax revenues hold up! The roads to town, to schools, to the doctor and hospital are always open. And when you specify Snogo you are specifying a proved machine backed by 13 years of service in the field.

KLAUER MANUFACTURING COMPANY
Dubuque, Iowa


See SNOGO at the Road Show
space J-9
International Amphitheatre
CHICAGO
A SNOGO for Every Job—
from 1-ton to the largest four wheel drive truck
A SNOGO FOR EVERY BUDGET!
No excuse now for not having a Snogo.
SNOGO

The state highway construction completed in 1929 included 31.2 miles of untreated gravel road and 149.6 miles of low cost bituminous mix. In addition 8 bridges and 4 grade separations were completed. The uncompleted work carried over to 1940 included 28.2 miles untreated gravel and 89.7 miles low cost biutuminous mix.

The construction program for 1940 calls for 46 miles untreated gravel road, 202 miles low cost bituminous mix, 5 bridges and 5 grade separations.

PROBABLE STATE HIGHWAY CONSTRUCTION IN 1940

	Miles
Grading and surfacing	288*
Cement concrete pavement	31*
Bituminous surfaces	265*
Bridges (number)	14*
Grade separations (number)	7*

*Does not include mileage carried over from 1939.

Oregon

State highway expenditures in 1939 included $6,100,000 for construction and $3,400,000 for maintenance. Probable amount available for state highway construction in 1940 is $6,500,000. Details of the 1939 and 1940 works are given in the tables.

STATE HIGHWAY CONSTRUCTION IN 1939

	Mileage Completed During 1939
Graded and drained earth	160
Waterbound macadam, untreated	260
Waterbound macadam, treated	410
Bituminous concrete	10
Bridges (number)	14
Grade separations (number)	3

PROBABLE STATE HIGHWAY CONSTRUCTION IN 1940

	Miles
Graded and drained earth	140
Waterbound macadam, untreated	300
Waterbound macadam, treated	350
Bituminous macadam	20
Bituminous concrete	18
Bridges (number)	15
Grade separations (number)	3

Includes carry-over mileage from 1939.

California

The California Division of Highways operates upon a biennial basis; the current biennium covering the period from July 1, 1939, to June 30, 1941. As it is difficult to estimate the amount of work to be placed under way during a calendar year, the figures given below for estimated construction and maintenance activities represent the value of work planned to be placed under way during the remaining 18 months of the biennium. Roughly, work for the calendar year of 1940 should be approximately two-thirds of the figures given, however, past experience indicates that the larger portion of biennial work is placed under way during the two middle quarters of the biennium.

Estimated work for 1940 and first six months of 1941 includes $27,083,000 for construction and $9,623,500 for maintenance, including the operation and maintenance of the San Francisco-Oakland Bay Bridge.

During the calendar year 1939, state highway expenditures in California amounted to $18,744,800 for construction and $9,369,900 for maintenance, which also includes the Bay Bridge.

The following tabulation gives the mileages of various types of highway construction by the Division of Highways for the calendar year of 1939.

Type	Miles
Grade and pavement	31.6
Grade and plant-mixed surface	121.4
Grade and road-mix surface	103.2
Grade and oiled gravel surface	92.9
Armor coat and retread surfaces	122.6
Penetration and seal coat surfaces	342.9
Grade and untreated gravel surface	12.6
Grading only	5.8
Dust oiling	313.6
Shoulder treatment	73.5
Bridges and grade separations (number)	(111)

JOINT CONFERENCE ON STANDARD CONSTRUCTION CONTRACTS

Actions of the Joint Conference on Standard Construction Contracts were summarized Jan. 4 by Managing Director Edward J. Harding, of the Associated General Contractors of America, at whose invitation the conference was revived in December after a lapse of several years.

A study of construction contract procedure was embarked upon, and the conference decided to meet again in the middle of February.

The conference was composed of official representatives from the American Association of State Highway Officials, American Engineering Council, American Institue of Architects, American Railway Engineering Association American Society of Engineers, American Water Works Association, Western Society of Engineers, and the Associated General Contractors of America.

After examination of an outline of contract problems presented by the A.G.C., the conference undertook a continuing study looking forward to development of recommendations calculated to keep construction contracting procedure abreast of changing conditions. In the studies a contract will be interpreted as including all documents relating to it, the formal contract, the general conditions, plans and specifications.

The A.G.C. brief prepared for conference consideration made certain recommendations for changes, outlined situations deemed in need of correction, and outlined practices not within the scope of contract documents in which remedies could be made.

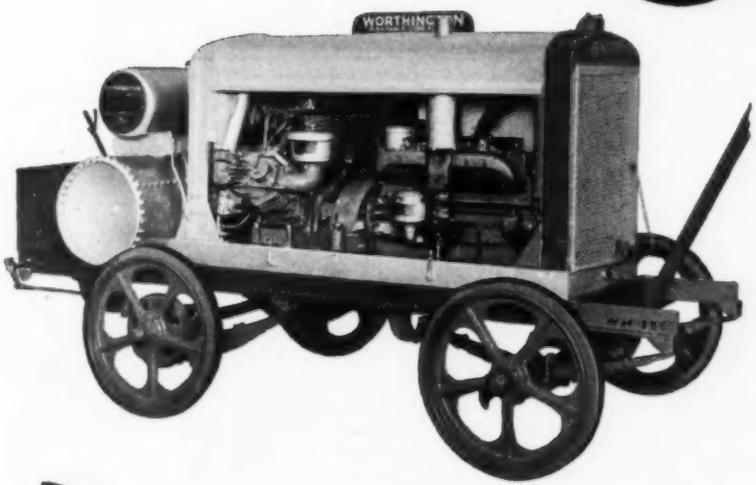
The A.G.C. recommended an emergency clause for public and private contracts which would provide that, in case the President declared an emergency, contractors would be reimbursed for delays and increased costs caused by the emergency, and would provide an appropriate procedure for termination of contracts.

It also recommended that on public work contractors be reimbursed for delays caused by government action, and that procedure of the U. S. Engineer Corps be followed in requiring owners to pay taxes assessed after the contract had been awarded.

Contract or specification provisions which have arisen and seem in conflict with sound procedure were outlined as those which require contractors to guarantee specfied methods and the results; the refusal of owners to guarantee elevations or borings shown on plans; "catch-all" clauses which make contractors responsible for mistakes on plans; and authorization for owners to dispense contractors' funds.

Outside the scope of contract documents, the A.G.C. outlined procedures between contractors, architects and engineers where standardization of practices would improve conditions and tend to reduce costs.

See them at the Road Show ...Booth P-5



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All types of mountings

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EXHIBITORS AT ROAD SHOW

The following is a list of the exhibitors, their exhibits and their representatives at the 1940 Road Show. The list is as complete as we could make it up to the time of going to press.

J. D. Adams Company, J-8—Motor graders, leaning wheel graders, hauling scrapers, tamping rollers. Representatives in attendance: E. E. Christena, office staff and branch managers. Hotel headquarters: Stevens.

Aeroil Burner Co., Inc., W-5—"Heet Master" road building kettle with power spray and barrel hoist; cut-back sprayer with single-unit safety control valve; traffic reflective signs and signals. Representatives in attendance: Geo. P. Kittel, Pres.; Pierre W. Gianinni, Mgr. Traffic Div.; R. S. Arthur, Mgr., and R. Adair of Chicago office. Hotel headquars: Stevens.

Alemite Division, Stewart - Warner Corporation, N-8 — Lubrication equipment and lubricants. Representatives in attendance: Chas. I. Kraus, Courtney Benedict, Delmar Stewart, E. R. Harris, J. Carson, A. W. Reid, all of the Alemite Division, Stewart-Warner Corp., and W. Pennock and D. J., Ward of Alemite Sales Co., Chicago, Ill.

Allis-Chalmers Mfg. Co., A-3—New line of Diesel tractors—3 models—regular gasoline tractor line, wheel tractors, power controlled graders, speed patrols, including new low-cost patrol, power units (19-110 h.p.), allied equipment, including new 18 and 20 yd. scrapers. Representatives in attendance: H. C. Merritt, Vice-Pres.; W. A. Roberts, General Sales Mgr.; M. L. Noel, Industrial Sales Mgr., assisted by entire sales organization, including Canadian representatives. Hotel headquarters: Morrison.

American Cable, Division of American Chain & Cable Co.—Tru-Lay preformed wire rope, slings and fittings. E. H. Todd in charge.

American Manganese Steel—Renewable lip dippers together with various types of teeth, hard-facing welding rods, nickel-manganese steel welding rod, Amsco material handling pumps and other parts and products for road builders, of Amsco manganese steel. In attendance will be W. M. Black, Vice-Pres.; J. P. Murtaugh, C. F. Mitchell and E. J. Nist.

Anthony Co., Inc., M-17—Anthony hydraulic "low loading height" hoist dump bodies, from 5 to 30 ton capacities. Representatives in attendance: R. R. Howard, Vice-Pres.; E. E. Smalley, W. E. Goebel, J. G. Reinhard. Hotel headquarters: Palmer House.

Ariens Company, U-21—Ariens Manufacturing Company will exhibit its Aggmixer machine, for use in soil stabilization work.

Armco Drainage Products Assn., S-19—Armco pipe-arches, Armco sheeting, Armco blast plates, Armco tunnel liner plates, multi-plate pipe and arches, paved invert pipe, perforated pipe and bin-type retaining walls. Representatives in attendance: S. R. Ives, Gen. Mgr.; M. C. Patton, Asst. Gen. Mgr.; G. E. Shafer, Chief Engr.; H. E. Cotton, Drainage Engr.; W. H. Spindler, Publicity Mgr. Hotel headquarters: Palmer House.

Athey Truss Wheel Co.—See Caterpillar Tractor Co.

Austin-Western Road Machinery Co., J-2-3—Eight-yd. scraper of entirely new design. "99" loader, "99" finisher, improved patrol sweeper, the 4-44 tractor, improved cadet roller. Officials and executives in attendance include: S. F. Beatty, Pres.; H. M. Kleiser, F. L. Jerome, K. N. Forbes, and H. B. Bushnell, Vice-President; R. K. Stiles, Sales Mgr.; and H. F. Barrows, Adv. Mgr. Hotel headquarters, Stevens Hotel.

The Baker Mfg. Co., E-10 — Baker bulldozers, grade builders, hydraulic scrapers and snowplows for trucks and tractors. Representatives in attendance: W. C. Staley, Vice-Pres.; L. A. Ginzel, Secy.; J. G. Miller, Asst. Sales Mgr.; F. E. Baker, F. L. Kennedy and O. S. Brodnax, sales representatives. Hotel headquarters: Knickerbocker.

Balderson Manufacturing Co.—See Caterpillar Tractor Co.

Barber-Greene Co., F-4 — Barber-Greene finisher, mixer, bucket loader, and 30-ft. permanent belt conveyor; also motion pictures of the machines in action.

Barco Manufacturing Co., V-20—Gasoline hammers, pavement breakers, rock drills, diggers, tampers, sheeting drivers. Representatives in attendance: J. H. Brown, E. R. Boddinghouse, A. W. Willich. Hotel headquarters: Stevens.

Barnes Manufacturing Co.—A line of pumps, including self-priming centrifugals, diaphragm and force pumps.

Barrett Company—The exhibit will be built around the Tarvia truck, from which cider will be served as at past Road Shows. Demonstrations and illustrations of the latest and best methods of using Tarvia and Tarvia-lithic for road and street construction, maintenance and repair will also form part of the exhibit.

Bay City Shovels, Inc., F-6—Three of twelve models of convertible shovels equipped as ½ yd. trench-hoe, ¾ yd. dragline, including bucket, and 1¼ yd. high-lift shovel. Representatives in attendance: W. S. Ramsay, Pres.; Morgan Ramsay, Vice-Pres.; John M. Kerr, Chief Engr.; Frank Phillips and A. W. Reidinger. Hotel headquarters: Sherman.

Bendix-Westinghouse Automotive Air Brake Co., M-15—Operative display of Westinghouse air brakes and other items of Bendix - Westinghouse equipment. Also there will be the conventional exhibition of the Bendix-Westinghouse air clutch control, air gearshift control and air warning signals. Representatives in attendance: R. L. Morrison, Vice-Pres. and Gen. Mgr.; C. A. Ohl, Director of Sales and Engineering; F. L. Hall, Sales Mgr.; E. R. Fitch, Chief Engr.; D. H. Robinson, Production Service Mgr.; S. Johnson, Jr., Gen. Engr.; I. F. Nelis, New York Dist. Mgr.; A. V. Howe, Detroit Dist. Mgr.; R. H. Casler, Asst. Dist. Mgr., Chicago; W. D. Foltz, Dist. Engr., Chicago; A. E. Wolfe, representative, Cleveland; A. J. Bent, representative, Cincinnati; R. G. Justus, representative, St. Louis; W. V. Walkinshaw, representative, St. Louis; D. H. Seibert, representative, Minneapolis. Hotel headquarters: Congress.

Bethlehem Steel Co., S-15 — Cable highway guard rails; cable guard accessories, semi-rigid plate highway guard rails, highway expansion and contraction joints; bar mats; center strips; chair supports and other accessories; reinforcing bars; reinforcing units for concrete bridge floor slabs; wire rope and strand; bethanized fence; steel fence posts; hollow drill steel; jack rods. An operating model of a wire rope machine and a stranding machine will be on display in the booth. Representatives in attendance: W. S. Briscoe and J. E. McCracken.

The Black & Decker Mfg. Co., U-4—Representative line of portable electric tools, new "Hi-Way" loadmeters (portable truck scales), new "Aircraft" loadmeters (portable aircraft scales). Representative in attendance: E. E. Powell, Mgr. Loadmeter Dept. Hotel headquarters: Sherman.

Blackhawk Mfg. Co., T-29—Hydraulic controls for road building equipment, hydraulic jacks, wrenches. Representatives in attendance: D. L. Yarger, K. Kuehn. Hotel headquarters: Lincoln Park Arms.

Blaw-Knox Company, L-1 — Road finishers, truck mixers, clamshell buckets, road forms, and a photographic display of the complete line of Blaw-Knox construction equipment. Representatives in attendance: C. H. Lehman, R. T. Harris, A. A. Levison, J. C. McQuide, E. L. Harrington, H. B. Loxterman. Hotel headquarters: Palmer House.

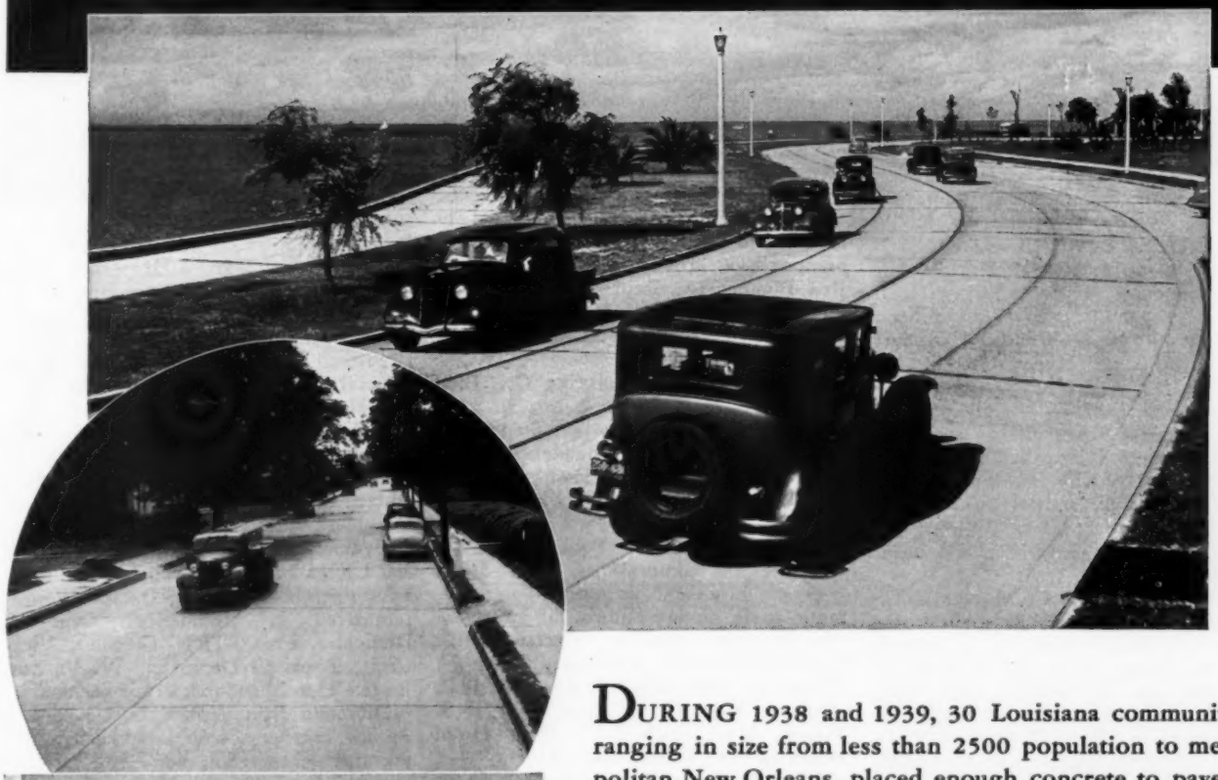
Brooks Equipment & Mfg. Co., 2-3—Load lugger, rock crusher, limestone pulverizer. Representatives in attendance: L. Wallace Brooks, R. S. Tucker, W. F. Buchanan. Hotel headquarters: Stevens.

Broderick & Bascom Rope Co.—Miniature wire rope strander; also a miniature closing machine actually manufacturing small diameter cord.

Wm. Bros Boiler & Mfg. Co., T-22—Circulating tank car heater (booster), rotary plow. Representatives in attendance: J. D. Aldrich, J. R. Ritchie. Hotel headquarters: Stevens.

Buda Co., T-D—Buda-Hubron earth drill, Buda-Lanova 6-cylinder diesel industrial power unit, 15 KW diesel-elec-

In just 2 years,
30 Louisiana towns have placed 1,457,000 square yards of CONCRETE STREETS



(*Top*) Lake Shore Drive in New Orleans. A total of 467,796 sq. yds. of concrete built in this city in the past two years.

(*Center*) Residential Lawrence Street, Lake Charles, La., paved with concrete in 1938. Total of 154,582 sq. yds. built in past two years.

(*Lower*) First Street in Morgan City, La., which built 40,950 sq. yds. of concrete in past two years.

DURING 1938 and 1939, 30 Louisiana communities, ranging in size from less than 2500 population to metropolitan New Orleans, placed enough concrete to pave 83 miles of streets 30 feet wide.

That's a lot of activity—and it will bring a lot of satisfaction. For concrete streets are a gilt-edge investment for any city. They're comfortable to drive on . . . they permit traffic to flow more readily . . . they increase business or residential property values . . . they save lives because they are skid-resistant in wet weather or dry.

For a given load-carrying capacity, concrete is a low cost pavement to build, and it is by far the *cheapest* of all pavements to maintain.

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tric generator set, specially designed engine display unit, 3 Buda-Lanova 6-cylinder diesel engines, 2 Buda-Lanova diesel industrial power units, 2 Buda gasoline engines, Buda hydraulic diesel nozzle testers, several models of Buda hydraulic and mechanical lifting jacks.

Buckeye Traction Ditcher Co.—Clipper excavator, surface material spreader, RB finegrader, ditcher, RB roughgrader.

Bucyrus-Erie Co., G-4, A-5 and B-1—New Bucyrus-Erie 54-B, 2½ yd., diesel-powered shovel, ⅜ yd. 10-B shovels, a 22-B crane equipped with a rock grab, and a cut-away 22-B revolving frame showing method of lubrication and mechanical details. In booths Nos. A-5 and B-1 several new models in bullgraders, bulldozers, 4-wheel scrapers, 2-wheel scrapers. Also the recently announced Bucyrus-Erie rippers and tamping rollers, the BECO hydraulic press, Bucyrus oil reclaimer, dragline chain and other Bucyrus-Erie specialties. Representatives in attendance: P. H. Birckhead, Gen. Sales Mgr.; J. A. Garber and Henry Jameson, Asst. Sales Mgrs.; F. O. Wyse, Publicity Mgr.; following district sales managers: F. Leslie Jones, L. E. MacDonald, C. B. Foster, H. A. Titus, J. H. Sackett, J. B. Stam and J. F. Tait.; Asst. Dist. Sales Mgr. W. R. Beebe and Sales Representatives H. J. Vines, S. R. Waller, E. B. Chambers, J. E. Marson, M. R. Robinson, Robert Campello, B. L. McKenney, H. L. Risher and T. G. Paulsen.

Butler Bin Co., Q-2—Bulk cement handling plant, aggregate weighing batcher, water weighing batcher, cement unloading tractor, model of aggregate batching bin. Representatives in attendance: M. R. Butler, C. E. Riblet, Kenneth Kerr, M. A. Kelly. Hotel headquarters: Stevens.

The Byers Machine Co., Ravenna, O., G-11—One ¾ yd. Model 83 chain crowd gas shovel. Representatives in attendance: Mr. Horr, Pres.; P. T. Redfern, Sales Mgr.; E. T. Geddes, Asst. Sales Mgr.; B. S. Ferguson, Chief Engr.; D. B. Edmundson, Sales Dept., and F. D. Hooper, Eastern Dist. Mgr.; C. J. Fulweber, Cashier and Asst. Treas. Hotel headquarters: Palmer House.

Calcium Chloride Association, T-4—Demonstrations and test data on the use of calcium chloride for ice control, concrete curing and road consolidation and dustproofing. Representatives in attendance: Ray A. Giddings, Fred Burggraf, Robert L. Fosburg, Allison, Ind., Bernard P. Thomas, Fred Sweany, Norman L. Torgerson. Hotel headquarters: Sherman.

The Philip Carey Co., S-21—Hand samples and literature. Representatives in attendance: V. V. Malcom, H. K. Sharp. Hotel headquarters: Stevens.

Ralph B. Carter Co., R-2—Contractors' pumps. Representatives in attendance: Ralph B. Carter, Jr., Jack Van Atta. Hotel headquarters: Palmer House.

J. I. Case Co., Racine, Wis.—Model "RI" tractor with Detroit mower, Model "DI" tractor, Model "LI" tractor with Hesselman engine and 15.00x28 single broad base rear tires. Representatives in attendance: G. W. Iverson, M. C. Anderson, M. R. Comer, T. R. Hall, Jr., Max McCrary, W. E. Chapman, J. M. Finlayson, L. L. Hoaglin, F. M. Stewart.

Caterpillar Tractor Co. and Allied Equipment Manufacturers—H-8, K-3, and J-7.—Displays include those of "Caterpillar," R. G. LeTourneau, Inc., LaPlant - Choate Manufacturing Co., Athey Truss Wheel Co., Trackson Company, Killefer Manufacturing Co., Balderson Manufacturing Co., and Willamette-Hyster Co. Much interesting new equipment will be shown. Caterpillar Tractor Co.—Five sizes of "Caterpillar" Diesel Tractors fitted out with bulldozers, scrapers, snow plows, rippers, high shovels, wagons and other equipment. A 66 h.p. No. 12 motor grader, the new 35 h.p. No. 212 motor grader, and the largest of the "Caterpillar" blade grader. Ten sizes of "Caterpillar" engines, nine of them diesel, will be shown. R. G.

Centaur Corporation, L-4 — Centaur Model KM highway mower. Representatives in attendance: K. E. Gifford, C. B. Hall. Hotel headquarters: Stevens.

Chain Belt Co., F-3, Q-1 — 1940 models of Rex mixers, Rex water pumps, Rex Moto-mixers, Rex pavers, Rex Pumpcrete. Representatives in attendance: G. K. Viall, Vice-Pres.; B. F. Devine, Sales Mgr.; D. A. Kalton, R. T. Sherrod, A. W. Thomas.

C. H. & E. Manufacturing Co., Inc., S-33—New saw rig, new line of self-priming pumps, hoist, roller, diaphragm pump, bar cutters and benders. Representatives in attendance: Frank F. Hase, John H. Hase. Hotel headquarters: Stevens.

Chicago Pneumatic Tool Co., H-1—Portable air compressors, rock drills, concrete breakers, wagon drills, pneumatic tools, sludge pumps, air and electric concrete vibrators, electric drills. Representatives in attendance: John N. Thorp, Jr., Mgr. Const. Eqpt. Div.; J. F. Huvane, Mgr. Compressor Div.; J. S. Hazen, Mgr. Rock Drill Div. Hotel headquarters: Palmer House.

Clay Products Association, T-27—A working model demonstrating the use of vitrified clay drainage pipe for subsoil drainage of highways. Representatives in attendance: Robt. G. Scott, H. P. Hoskins, Charles H. Tapping.

Cleaver-Brooks Co.—Portable steam tank car heater; portable booster. Representatives in attendance: R. E. Brooks, J. C. Cleaver, Harold Clark, J. V. Resek, F. W. Hainer, W. H. Meneilley.

Cleveland Rock Drill Co., S-17—Rock drills, paving breakers, diggers, tampers, wagon drills and accessories. Representatives in attendance: R. R. Morgan, Francis Wagner, M. F. Bragdon, L. W. Kale, A. J. Healy, Sam McCart, A. H. Hruby, El. L. Oldham. Hotel headquarters: Congress.

Cleveland Tractor Co., A-1—Up and over shovel on Cletrac "D," front-end loader on Model "B," Models "F," "A," and "H." Representatives in attendance: Miles, Ogle, Milligan. Hotel headquarters: Stevens.

Cleveland Trencher Co., U-9—Cleveland Model 80 tamper-backfiller. Representatives in attendance: V. S. Penote, A. R. Askue and J. R. Overs. Hotel headquarters: Stevens.

Coffing Hoist Co., U-19 — "Safety-Pull" ratchet lever hoists, "Quick-Lift" electric hoists, spur gear chain hoists, differential hoists and trolleys. Representatives in attendance: J. R. Coffing, Gen. Sales Mgr.; H. N. Hayes, Dist. Sales Mgr.

Construction Machinery Co., Q-5—Concrete, plaster and bituminous mixers, self-priming pumps, batching equipment, power saw-rigs, wheelbarrows and carts. Representatives in attendance: L. S. Holden, Pres.; G. A. Loveall, Sales Mgr.; H. R. McDermott, Chief Engr.; R. E. Ohler. Hotel headquarters: Stevens.

Contractors and Engineers Monthly—National and sectional awards for the 1939 roadside development competition will be featured.

Continental Motors Corp., W-16—Industrial engines and power units; engine-electric generator and lighting plants; battery chargers; truck engines; aircraft engines. Representatives in attendance: B. F. Tobin, Jr., Exec. Vice-Pres.; P. Dolph, Service Mgr.; I. Homrich, Sales Rep.; F. Crete, Booth Attendant; F. T. Schwilk, Gen. Sales Mgr.; F. T. Gould, Sales Promotion Mgr.; N. E. Brooks, Industrial Engr.; H. G. Piper, Mgr. Industrial Sales. Hotel headquarters: Palmer House.

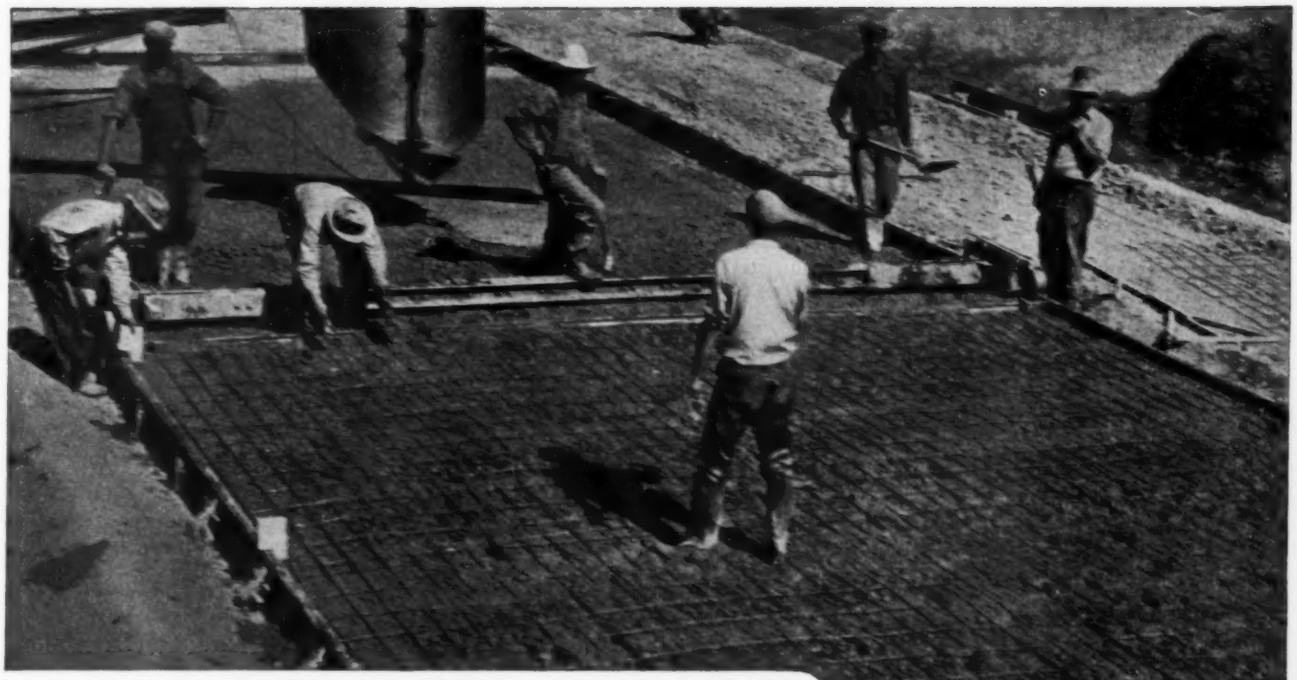
D-A Lubricant Co., Inc., H-2—Representatives in attendance: Frank L. Binford, Pres.; L. S. Graham and several members of the sales organization. Hotel headquarters: Stevens.

Dempster Bros., Inc., M-10—Model 300 LF (3 cu. yd.) Dempster-Dumpster with drop-bottom buckets, etc. Representatives in attendance: Geo. R. Dempster, Pres.; Thos. G. Shea, Vice-Pres.; Thos. C. Dempster, W. V. Zoe, Engr. Hotel headquarters: Sherman.

Diamond Iron Works, Inc., E-9—10x24 jaw crusher, 24x36 jaw crusher, 3x6 vibrator screen, belt conveyor carriers, rotor-lift portable crushing and screening plant. Representatives in attendance: L. J. Reay, Pres.; W. G. Barston, Vice-Pres.; G. C. Winther, Chief Engr.; C. T. Johnson, Byron Cogswell, E. S. Solmonson and C. T. Knowles, sales representatives. Hotel headquarters: Palmer House.

Dimick Mosher Products Co., S-7—Miniature test tanks showing difference in carry-off in capacity of various types of commercial underdrains; also skip pipe in cast iron and vitrified clay; full size commercial products. Hotel headquarters: Stevens.

The Dow Chemical Co., W-20—Showing uses of Dowflake calcium chloride for construction and maintenance of stabilized roads, ice control, concrete curing, etc.; also other products of company. Representatives in attendance: Don Williams, H. T. Knowles, F. M. Whaley, H. H. Miller of Midland and 15 salesmen from territory and branch offices. Hotel headquarters: Bismarck.

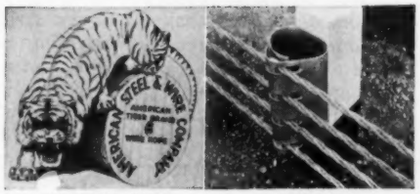


ADD AN *Extra Lifetime* TO CONCRETE HIGHWAYS

CONCRETE highways last longer, stay smoother and cost less to maintain when they are reinforced with wire fabric. For the interlaced wires of steel bind the concrete together and help prevent cracking. Should cracks appear, their spreading is definitely retarded by the wire fabric.

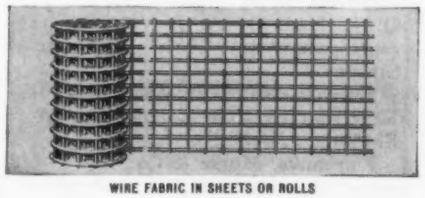
Construction men have found that the application of wire fabric is quick, simple and trouble-free. No skilled labor or special tools are required for installation.

U·S·S WIRE FABRIC is made of high-yield-point cold drawn steel. The wires are closely spaced to provide uniform stress distribution. Available for quick delivery in either sheets or rolls—in Electric Welded Rectangular or Square Mesh and in Triangle Mesh. Write us for further information. Our engineers will be glad to show you how U·S·S Wire Fabric can add an extra lifetime to your concrete highways.



AMERICAN TIGER BRAND WIRE ROPE

MULTISAFTY CABLE HIGHWAY GUARD



WIRE FABRIC IN SHEETS OR ROLLS

AMERICAN STEEL & WIRE COMPANY

Cleveland, Chicago and New York

Columbia Steel Company, San Francisco, *Pacific Coast Distributors* · United States Steel Export Company, New York

UNITED STATES STEEL

Eagle Crusher Co., Inc. — Material loader; crusher. Representative in attendance: C. L. Wood. Hotel headquarters: Palmer House.

Edison-Splitdorf Corporation, O-4—Complete line of Edison-Splitdorf magnetos, Edison spark plugs and ignition devices for internal combustion gasoline engines. Representatives in attendance: Lee L. Sable, Sales Engr.; A. J. Clark, Vice-Pres. and Gen. Mgr.; W. J. Greenop, Service Mgr.; E. D. Roach, Central Dist. Sales Mgr. Hotel headquarters: Stevens.

Electric Tamper & Equipment Co., W-18—Jackson vibratory paring tube, Jackson VS-E1 vibrator, Jackson hydraulic vibrator, Jackson hand screed, Jackson portable power plants. Representatives in attendance: C. Jackson, H. W. Cutshall, Raymond Johnson, M. S. Westlund, Raymond Hermann, Lowell S. Osborn, J. F. Hensel. Hotel headquarters: La Salle.

Electric Wheel Co., S-34—A few late items will be exhibited but complete information, including photos, drawings, etc., will be available on the complete line. The booth will be in charge of F. F. Alexander, Vice-Pres. and Sales Mgr., assisted by members of the sales and engineering departments.

E. D. Etnyre & Co., L-6—1,000 gal. "Black Toffir" model FX and parts. The Mack Co., Chevrolet and International Harvester Co. will also exhibit an Etnyre "Black Toffer" on their respective chassis. Representatives in attendance: A. C. Renick, Geo. E. Pearson, Chas. Hvass, Sam Etnyre, B. D. Etnyre, H. H. Etnyre and Geo. M. Etnyre. Hotel headquarters: Palmer House.

Euclid Road Machinery Co., H-7—New model LDT-63 W Euclid earth mover, 9-11 yd. bottom dump Euclid, 2 FD Euclid heavy duty earth mover, and shown for the first time, Euclid 10-yd. scraper. Representatives in attendance: E. H. Parkhurst, president; R. Q. Armington, general manager; E. F. Armington, sales manager, S. F. Armington, chief engineer, G. E. Armington, factory manager; D. R. Anderson, service manager; J. R. Blackburn, H. K. Church, E. C. Dellen, J. K. Greer, W. F. Myer, E. H. Newby, R. V. Scott, sales representatives; R. A. Trippeer, W. Brown, Memphis branch managers; V. L. Snow, engineer; L. M. Bishop, G. F. Bones, O. T. Hadlock, A. J. Vernick, service representatives. Hotel headquarters, Stevens.

Everhot Mfg. Co.—Branding irons. Representatives in attendance: A. C. Flothow, I. Benes.

Fairbanks, Morse & Co., M-13—Magnetos. Representatives in attendance: F. J. Bartella, Sales Mgr.; J. Weitner, L. Keith. Hotel headquarters: Stevens.

Fate-Root-Heath Co., S-24—Silver King Hi-Way mower. T. R. Gerken, factory representative in charge of exhibit.

The Four Wheel Drive Auto Co., P-6—New FWD soil sampler; FWD Model HG with underbody blade for road maintenance; FWD Model SU for year-'round highway service. Representatives in attendance: W. A. Olen, Pres. and Gen. Mgr.; R. H. Schmidt, Gen. Sales Mgr.; F. M. Higgins, Adv. Mgr.; S. H. Sanford, Mgr. Western Div.; A. E. Fredenberg, Mgr. Eastern Div., and H. B. Dodge, Chief Engr. Hotel headquarters: Congress.

Fruehauf Trailer Co., L-7 — One Model CPT 25-ton carryall semi-trailer. Representative in attendance: W. G. Retzlaff, Asst. Gen. Sales Mgr. Hotel headquarters: Stevens.

Fuller Mfg. Co., 0-7—Transmissions. Representatives in attendance: W. E. Niness, Sales Mgr.; E. L. King, Service Mgr. Hotel headquarters: Stevens.

The Galion Allsteel Body Co., O-5—Unique display layout, together with showing new style GH-56 hydraulic hoist and model 12 dump body; also parts assemblies. Representatives in attendance: B. J. Heiser, E. Krieger, V. K. Gaston, G. E. Herr, J. C. Gay. Hotel headquarters: Palmer House.

The Galion Iron Works & Mfg. Co.—Galion Earth Move (new piece of equipment), one hydraulic pull grader, two motor graders, seven road rollers. Representatives in attendance: John L. Connors, Vice-Pres. and Gen. Mgr.; John S. Boyd, Vice-Pres.; Ralph E. Boyd, Vice-Pres.; C. F. Boyd, Sales Mgr.; G. D. Finney, Asst. Sales Mgr. Hotel headquarters: Stevens.

Gardner-Denver Co., S-10—ABY 85 ft. streamlined utility portable air compressor, UM-99 wagon drill, complete line of sinking drills, paving breakers, clay spaders, cutaway display model of compressor. Representative in attendance: R. H. Pearson. Hotel headquarters: Palmer House.

General Excavator Co., F-8—Model 307 excavator. Don B. Smith, Sales Mgr., in charge.

General Motor Sales Corporation, P-1—Exhibit will show the many uses of Hyatt roller bearings in road building and construction machinery, including shovels, rollers, graders, tractors, pumps, engines and mixers. In attendance will be C. L. Newby; J. M. Kelly; T. A. Russell; H. M. Carroll and others.

The Geneva Metal Wheel Co., W-12—Solid and pneumatic wheels, also steel-rimmed wheels, bearings and axles. Representatives in attendance: H. A. Carter, R. E. Sawyer, H. A. Ford. Hotel headquarters: Stevens.

W. S. Godwin Co., J-1—Expansion and contraction joints for concrete paving; steel curb guards. Representative in attendance: W. S. Godwin. Hotel headquarters: Stevens.

W. E. Grace Mfg. Co., T-15—"Rapid Fire" combination bituminous booster and tank car heater; new model Grace road sweeper. Representative in attendance: W. E. Grace. Hotel headquarters: Stevens.

Gulf Oil Corporation—Representatives in attendance: A. E. Brice, Fred Humphrey, R. M. Welker and E. L. McMillan.

George Haiss Mfg. Co.—Will feature a hipower digging clam shell bucket, together with photographic enlargements of recently developed self-feeding bucket loaders.

Hamilton Mfg. Co.—The new Hamilton auto-shift drawing table will be exhibited, together with the Hamilton-Calumet shallow-drawer units.

Heil Co., A-6—New hydraulic motor scoop; new hydraulic trailbuilder; new semi-trailer truck scoop; new cable scoop; hydraulic Dig-N-Carry tractor scoops; tamping rollers and hydraulic dump units. Representatives in attendance: Jos. F. Heil, Exec. Vice-Pres.; T. A. Miller, Sales Mgr., Road Machinery Div.; E. C. Gilmore, Sales Mgr., Body and Hoist Div.; H. F. Pugh, Adv. Mgr.

Hercules Co., F-B—Working exhibit of the Hercules transmission, also model of standard Hercules roller. Carl G. A. Schmidt, sales manager, is in charge.

Hercules Motors Corp., S-5—Complete line of Hercules heavy duty high speed internal combustion engines and power units, gasoline and diesel. Representatives in attendance: Charles Balough, John Keplinger, Chas. Weekes, E. A. Haskins, G. W. La Salle, D. W. Latta, Wm. Lynch, C. R. Schuler, W. W. Crowley, W. A. Radtke. Hotel headquarters: Palmer House.

Hercules Steel Products Co., O-8—Pictorial representation; hoist model. Representatives in attendance: E. P. Monroe, Sr., H. L. Ekin, Fred Biszantz, E. P. Monroe, Jr. Hotel headquarters: Morrison.

Hetherington & Berner, Inc., K-1—Asphalt mixer; Fluidometer asphalt metering system; vibrating screen, etc. Representatives in attendance: R. B. Berner, Robt. Berner, A. T. Clay, D. R. Berner. Hotel headquarters: Stevens.

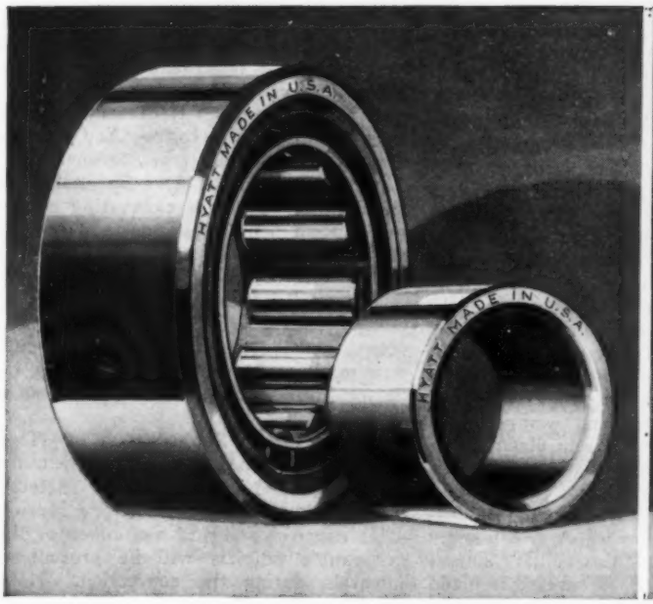
Frank G. Hough Co., N-7—Operating model of an Allis-Chalmers WM tractor and Hough shovel, also representative full size units of Hough equipment for material handling and road building.

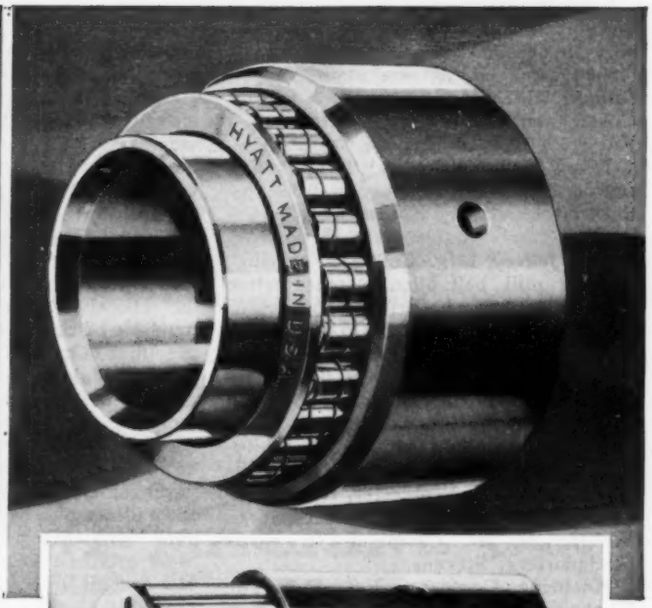
The Huber Manufacturing Co., Marion, O., J-10—Huber 10-ton diesel roller, 8-10 tandem roller, No. 4 superior grader and "BG" light maintainer. Representatives in attendance: M. E. Miller, J. M. Miller, G. N. Porter, L. E. Aukerman, all from factory; Ray Hamilton, Mgr. Indianapolis Branch; D. J. Carey, Mgr. Harrisburg, Pa., Branch. Hotel headquarters: Auditorium.

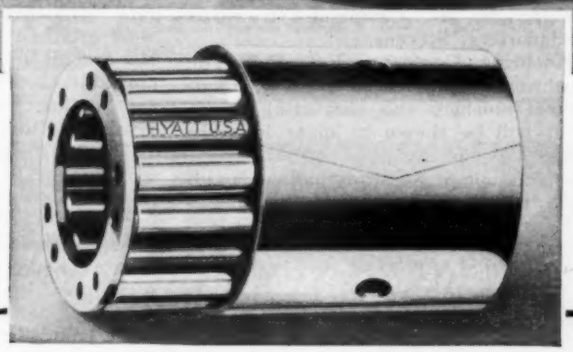
Hyatt Bearings, P-1 — Exhibit the many uses of Hyatt roller bearings in road building and construction machinery—shovels, rollers, graders, tractors, pumps, engines, mixers, etc. Those in attendance: H. K. Porter, Gen. Sales Mgr., Harrison, N. J.; C. L. Newby, Western Div. Mgr., Chicago, Ill.; J. M. Kelly, Central Div. Mgr., Pittsburgh; T. A. Russell, F. H. Webster, L. F. Stuebe, Sales Engrs., Chicago; L. L. Hill and M. B. Barbe, Sales Engrs., Pittsburgh, and H. M. Carroll, Adv. Mgr., Harrison, N. J. Hotel headquarters: Stevens.

Independent Pneumatic Tool Co., O-11—Thor sinker, drifter and stoper, rock drills, paving breakers, backfill tampers, clay and trench diggers, sump pumps and other contractors' portable air tools. Representatives in attendance: H. J. Schultz, J. O'Leary, S. L. Davis,

SERVING AND SAVING
YEAR AFTER YEAR







AT THE ROAD SHOW let us demonstrate how Hyatts can serve you. Space P-1 on second floor of Amphitheater.

In all makes and kinds of road building and construction machinery, year after year, you witness the widespread application of Hyatt Roller Bearings. Now, in the new machines, you again will see Hyatts serving and saving . . . everywhere.

Shovels, graders, rollers, mixers, tractors, trucks, etc. . . longer lived machines, with Hyatt equipment, ready for work without worry of bearing wear or care or replacement. Hyatt Bearings Division, General Motors Sales Corporation, Harrison, New Jersey; Chicago, Pittsburgh, Detroit, San Francisco.

HYATT *Roller* BEARINGS

J. T. Kirby, N. C. Hurley, Jr., B. Marsh, B. J. Herron and C. N. Kirchner. Hotel headquarters: Stevens.

Insley Manufacturing Corp., F-1—⅜ yd. shovel, readymix receiving bucket and concrete cart. Representatives in attendance: Ray Dorward, Sales Mgr.; A. C. Rasmussen, Chief Engr.; W. H. Insley, Pres.; D. H. McNaughton and L. W. Bruck of sales department. Hotel headquarters: Stevens.

Iowa Manufacturing Co., G-15, H-10—Kubit impact breaker, diesel electric portable crushing plant, 3,000 lb. asphalt plant with dryer. Representatives in attendance: Messrs. Hall, Lindsay, Plumb, Gossard, Pollitz, Lorig, Crozer and Riley. Hotel headquarters: Stevens.

Jaeger Machine Co., C-1, C-2—Paving and construction machinery. Representatives in attendance: Entire sales department. Hotel headquarters: Stevens.

The Jeffrey Mfg. Co., S-30—Chains, hammer mill, belt idler. Representative in attendance: L. E. Brill.

Killefer Manufacturing Co.—See Caterpillar Tractor Co.

Kinney Manufacturing Co., L-3—Kinney bituminous distributor mounted on White truck; Kinney steam jacketed pump for handling all sorts of bituminous materials. Representatives in attendance: W. E. Worcester, A. J. Munday, Claude Hill, H. G. Saunders, R. C. Webster, C. D. Campbell, Jr. Hotel headquarters: Stevens.

Koehring Company, F-2, D-3—The Koehring Twinbatch 34-E paver, longitudinal finishers and excavating equipment will be shown in space F-2. In space D-3 the company will show the complete line of Koehring hauling equipment, mixers and mud-jack, with photographic presentation of equipment in action. More than 10 different types of Koehring heavy-duty construction equipment will be on exhibit. The complete staff of sales managers, sales engineers, sales representatives and distributors will be in attendance.

LaPlant-Choate Manufacturing Co.—See Caterpillar Tractor Co.

The Lauson Co., W-13—Complete line of Lauson vertical air and water-cooled engines from ½ h.p. up to 5 h.p., with clutches, gear reductions, extended crankshafts, crankcase mountings, showing their adaptability for use in connection with small self-priming pumps, compressors, blowers, concrete mixers, sand spreaders, road marking machines and other road building and industrial equipment. Representatives in attendance: C. O. Piper, F. H. Edson, E. Wulff, H. E. Bruns. Hotel headquarters: Stevens.

Le Roi Co., L-4—New 4-cylinder air-cooled engine; several 2-stage portable air compressors, including new 85 cu. ft. model. Representatives in attendance: C. W. Pendock, Pres.; W. R. Karll, Gen. Sales Mgr.; Donald Heffron, Compressor Sales Mgr.; J. D. BeVier, Service Mgr.; N. M. Sedgwick, Compressor Sales; T. S. Tuttle, Sales Promotion Mgr. Hotel headquarters: Stevens.

A. Leschen & Sons Rope Co., G-3—A complete assortment of samples of wire ropes that are used today on all types and kinds of road building machines and equipment. These samples will include the well-known "Hercules" (red-strand) wire rope in round strand and flattened strand constructions in both standard and pre-formed types. Representatives in attendance: M. R. Arnold, E. J. Schillinger, V. C. Browne, W. C. Richards and L. H. Gault. Hotel headquarters: Stevens.

Letourneau, Inc. — LeTourneau cable control carryall scrapers. Several sizes will be shown teamed with the correct model of Diesel tractor. Cable controlled bulldozers and rippers will also be displayed. LaPlant-Choate Manufacturing Co., Inc.—LaPlant-Choate bulldozers, trailbuilders, rear dump scrapers and tamping rollers, also first public showing of new 16-yd. positive push-out type scraper. Athey Truss Wheel Co.—A 27,000-lb. quarry type trailer teamed with a 97 h.p. "Caterpillar" Diesel D8 tractor. Also an entirely new line of equipment will be shown for the first time. Trackson Co.—Three sizes of high shovels mounted on "Caterpillar" Diesel tractors. Killefer Manufacturing Co.—Revolving scrapers for use with smaller tractors in cleaning up around culverts, moving small earth yardage, etc. Road disks, rippers and road plows also will be shown. Balderson Manufacturing Co.—A V-40 snow plow attached to a "Caterpillar" Diesel D6 Tractor and a R-30 reversible blade plow attached to a "Caterpillar" diesel D4 tractor. Willamette-Hyster Co.—Hyster D8 towing winch mounted on a "Caterpillar" D8 Tractor with a LeTourneau ripper behind it operated by a line from the winch. A hyster D4 towing winch will be mounted on a "Caterpillar" Diesel D4 Tractor in conjunction with a Trackson High shovel; and a D2 towing winch will be on a D2 Tractor in conjunction with a LaPlant-Choate cable controlled bulldozer.

R. G. Letourneau, Inc., L-2, K-3 (cat)—Model "A" Tournapull, "NU" Carryall scraper (46 yds. heaped), D-8 Pushdozer. In "Cat" allied equipment section: "W" (23 yd.) Carryall, "X" (4 yd.) Carryall, K-3 extra heavy duty rooter, D-8 bulldozer, PCV. Representatives in attendance: H. L. Stilley in charge. All district representatives will attend plus R. G. Letourneau; Dean Burgess, Gen. Mgr.; E. R. Galvin, Sales Mgr.; K. F. Park, Field Engr.; S. D. Means, Federal Sales Mgr.; G. R. Huffman, Adv. Mgr. Hotel headquarters: La Salle.

Lima Locomotive Works, Inc., Shovel and Crane Division, G-5—One Lima Paymaster ¾ yd. shovel and one Type 750 dragline with 50 ft. boom and 2½ yd. Page automatic dragline bucket. Representatives in attendance: Henry Barnhart, J. E. Mereness and J. W. Fawcett, all managers. Hotel headquarters: Stevens.

Link-Belt Speeder Corp.—Two new models—a "300" series 1½ yd. Speed-O-Matic shovel and an LS-60 speeder with ½ yd. dipper.

Littleford Bros., H-9, J-4, J-5, J-6—Pressure distributor, tar kettle, road broom, bituminous resurfacer, line marker, tank car heater, wheeled roller, utilityspray tank, street flusher. Representatives in attendance: L. W. Glaser, R. G. Hext, H. Haupt, J. J. Strobel, H. Reynolds, S. Brent, A. Bayer, L. Bradshaw, R. Littleford, J. S. Littleford, Jr. Hotel headquarters: Stevens.

The Lufkin Rule Co., S-1—Measuring tapes, rules, precision tools. Representative in attendance: R. M. Benjamin. Hotel headquarters: Stevens.

Mack Trucks, Inc., M-8—Model FJ dumper, Model CH road oil distributor, Model EH for state maintenance work. Miscellaneous display of engines, transmissions and axles. Representatives in attendance: M. C. Horine, A. G. Crockett. Hotel headquarters: Stevens.

Macwhyte Co., E-3 — Specially designed wire ropes for excavating equipment. Representatives in attendance: J. A. Long, A. B. Moseley, F. J. Nelson and several representatives. Hotel headquarters: Stevens.

Mall Tool Co., S-23—Gasoline engine, concrete vibrators with attachments, new models of saws, drills, highway vibrators, flexible shaft grinders and sanders, and other portable tools.

Marion Steam Shovel Co., G-6—Two Marion excavators incorporating a number of decided improvements. Attending the show will be the entire Marion sales organization and a number of the company's officials will be present at intervals during the convention. Hotel headquarters: Stevens.

Marvel Equipment Manufacturers Division of Construction Equipment Co., U-16—Marvel-Wyco vibrators, grinders and concrete breakers, Marvel-Socko portable one-man concrete breakers, Chausse maintenance and emulsion spraying kettles, Marvel tractor shovels, cranes. Representatives in attendance: H. Erickson, A. Buhl, W. E. Chausse, Ken Carter, Verne Krieg, Norm Woodin, O. E. Trenton. Hotel headquarters: Illinois Athletic Club.

Master Vibrator Co., T-12—Full line of concrete high speed vibrators, generators and tools. Representatives in attendance: H. E. McCrery, O. H. Kiest. Hotel headquarters: Stevens.

McGraw-Hill Publishing Co., G-9—Copies "Engineering News Record," "Construction Methods and Equipment," "Engineering Construction Markets" and "McGraw-Hill Construction Daily" will be exhibited for complimentary distribution. Highway textbooks published by McGraw-Hill will also be on display.

Michigan Power Shovel Co.—Representatives in attendance: A. L. Bliven, J. W. Ralston, D. H. Ross, H. E. Ross, A. P. Ross, M. S. Ross, George Davis, R. E. Zebell.

Motor Improvements, Inc., M-3—The complete line of Purolators for use in road building equipment will be shown.

Murphy Diesel Co., T-16—Model ME 6 85-KW diesel electric generator set and Model ME650 200-h.p. supercharged 6-cylinder engine. Representative in attendance: Paul Schnetzky. Hotel headquarters: Stevens.

National Paving Brick Assn., U-2—

"1940--NEW THINGS TO SEE--1940"

●

On the Pennsylvania Turnpike

See one of the "FLEX-PLANE" 24-foot finishing machines at work with SECTIONAL SCREED—finishing 1″ slump concrete. See the first full width 24-foot SPREADING MACHINE ever made—spreading a mass of concrete 30″ high without screws. See the "FLEX-PLANE" direct screed starters, which check sidesway. See the new "FLEX-PLANE" LEANING SCREED WINGS. See the "FLEX-PLANE" GAS ELECTRIC and VIBRATED SCREED, joint installing machines, etc.—all sizes and kinds to suit your job. Some of these improvements at the Road Show, BOOTH P-9.

FLEXIBLE ROAD JOINT MACHINE CO.

WARREN, OHIO

A ROAD-SHOW EVERY DAY

where MICHIGAN TRUCK SHOVELS-CRANES are on the job!

"Yes Sir!... Our costs prove there are real savings in every MICHIGAN bucketful!"

"The day's last load's as easy as the first -- with MICHIGAN AIR CONTROLS!"

America's audience of contractors, public works officials, engineers applauds MICHIGAN'S performance records wherever this complete production unit is on location. MICHIGAN'S stamina and dependability—quick changeability to Crane, Clam, Dragline, Trench Hoe—time saving truck mobility and economy plus 28 m. p. h. road speed are high lights of the MICHIGAN picture...Available in 3/8 yd. and 1/2 yd. capacities—Single Axle, Dual Tandem and Four-Wheel Drives.

See the MICHIGAN at the Road Show -- Space P-5. Write today for WORK BOOK 35-10

MICHIGAN POWER SHOVEL Co BENTON HARBOR, MICHIGAN, U.S.A.

Samples of paving brick units as manufactured in various parts of the United States; literature and specifications regarding the proper use of brick as a paving material; moving pictures on construction of a brick pavement. Hotel headquarters: Congress.

Northwest Engineering Co., F-9—Power shovels. Representative in attendance: C. R. Dodge, Vice-Pres. Hotel headquarters: Palmer House.

Novo Engine Co., S-13—Self-priming centrifugal pumps, diaphragm pumps, new line of generator sets, Novo pavement breakers. Representatives in attendance: R. B. Harvey, Sales Mgr.; A. A. Ballantyne, Adv. Mgr.; E. A. Hunt, E. Hail. Hotel headquarters: Stevens.

The Ohio Oil Co., T-1—Complete display of liquid asphalts and asphalt cements used in all types of road building construction and also asphalts used in "Colprovia" process as well as "Lincoln-ite" powdered asphalt. Representatives in attendance: N. T. Stover, I. W. Lloyd, R. E. Stuntz, H. C. Offutt, John D. Wilkie, A. T. McKinney, H. B. Johnson and W. E. Kirkbride. Hotel headquarters: Stevens.

The Osgood Co., F-8—Model 800, their newest 1½ cu. yd. excavator. Representatives in attendance: George Day, Sales Mgr.; Jim Hoag, Mgr. Philadelphia Office; Frank Manning, Mgr. New York Office, as well as other members of the sales department.

Owen Bucket Co., G-13—Following new buckets will be exhibited: A ½ yd. type M narrow trench bucket with special teeth; a type K 1 yd. light alloy steel welded rehandling bucket, and a ¾ yd. type DX extra heavy round nose bucket. Also a model of the semi-blade grapple which will operate automatically. Representatives in attendance: H. W. Botten, Pres.; Edward Botten, Secy., Treas. and Sales Mgr.; W. S. Jenkins and W. H. Russell of the factory office; also L. L. Hanson, Central Dist. Sales Mgr.; P. T. Robin, Eastern Dist. Sales Mgr., and E. L. Kelzer, Western Dist. Sales Mgr.

Ozalid Corporation, T-10 — Ozalid whiteprint machines, Ozalid sensitized materials. Representatives in attendance: P. Ingraham, H. Sutton, W. Holsinger.

Perfection Steel Body Co., M-9—Representatives in attendance: V. L. Farnsworth, Harold H. Miller, L. H. Cleland. Hotel headquarters: Palmer House.

Pioneer Engineering Works, Inc., A-2—4 ft. x 8 ft. vibrating screen, 40x22 roll crusher. Representatives in attendance: Lewis W. Yerk, Pres.; Melvin Ovestrud, Vice-Pres.; K. E. Brunsdale, Sales Mgr.; C. K. Ordway, C. R. Rolf. Hotel headquarters: Palmer House.

Pittsburgh Steel Co., U-7—Large illuminated photographs of Pittsburgh safety highway guard, Pittsburgh reinforcement installations, displays of the product and comfortable lounging space for visitors. Representatives in attendance: Robert L. Glose, L. A. Ver Bryck, O. F. Arthur, K. D. Briggs, C. A. Lutz, E. T. Wible. Hotel headquarters: Stevens.

Portland Cement Assn., S-3—Color pictures automatically projected on a large screen to show outstanding concrete highway facilities throughout the country, emphasis on divided highway construction. Representatives in attendance: A. A. Anderson, W. F. Tempest, L. M. Arms, J. A. Foster, E. E. Duffy and E. C. Wenger. Hotel headquarters: Stockyards Inn.

Ransome Concrete Machinery Co., S-14, G-12—Representatives in attendance: W. Muller, president; A. P. Robinson, sales manager; T. R. Wilson, treasurer in charge of branches; Joe Williams, demonstrator and sales engineer.

W. A. Riddell Corporation, D-2—New model motor grader and quick transport general purpose road roller. Representatives in attendance: N. E. Jersey, Vice-Pres. and Gen. Mgr.; C. A. Beal, Mech. Mgr.; M. J. Bowers, E. J. Anderson, Sales Rep.; H. W. Deisler, Chief Engr. Hotel headquarters: Morrison.

Roads and Streets, H-5—Two panels, unique and distinctive in cartoon style and rendering, showing that widely known and irrepressible highway commentator character, "The Puddle Jumper," and his downtrodden companion, "Willie B. Damm," representing the car owner, will form an attractive, smile-provoking background in the ROADS AND STREETS space. Copies of the record-breaking Road Show issue will be available for complimentary distribution. Highway textbooks will be on display.

Rogers Hydraulic, Inc., K-7—Trailer presses for servicing tracks on crawler-type tractors, as well as presses for general work.

Rosco Manufacturing Co., W-14 — Rosco 800 gal. insulated distributor mounted on International cab-over-engine truck with cutout exhibit of 7-way valve showing all functions. There will be other functional units displayed in like manner. Representatives in attendance: T. W. Rosholt, Pres.; R. R. Moore, Secy.; Al Ingram. Hotel headquarters: T. W. Rosholt, Palmer House; R. R. Moore, Stevens Hotel.

Sauerman Bros., Inc., G-2—An illuminated pictorial display of excavating and stockpiling as handled by Sauerman power scrapers and slackline machines. Also will show scraper buckets and wire rope blocks. Representatives in attendance: D. D. Guilfoil, H. A. Roe, G. H. Tompkins, L. E. Dierks, B. T. Macy, Louis McLouth. Headquarters at company office, 438 S. Clinton St.

Schramm, Inc., S-16—Portable Model 60 (new), diesel portable 105 and 210, diesel portable 315, cut-open compressor showing construction. Representatives in attendance: H. N. Schramm, Pres.; A. O. Witt, Dist. Sales Mgr.; F. H. Wharton, Dist. Sales Mgr.; G. B. Comfort, Mgr. Sales Prom. Hotel headquarters: Stevens.

The Simplicity System Co., E-2—Complete operating model of Simplicity asphalt plant, of DuPont Lucite glass to make the entire travel path of aggregates visible. Also Simplicity 2-ton twin pug mill mixer and Simplicity apron type feeder, both in operation. Representatives in attendance: L. B. West, owner; W. C. West, Sales Mgr.; F. A. Salmon, Const. Engr. Hotel headquarters: Stevens.

The Sisalkraft Co., U-10 — Photographs and samples. Representatives in attendance: Franklin A. Richards, Mgr. Rd. Dept.; Robert C. Reschke, Chicago Ter.; E. M. Reynolds, New York Ter.

SKF Industries, Inc., O-6—Complete line of ball and roller bearings and transmission appliances. Representatives in attendance: R. H. De Mott, R. C. Byler, G. Palmgren, J. B. Castino, M. M. Middleton, P. A. Carlson, W. Jetter, R. Warrington, M. W. Passmore and Otto Neumer. Hotel headquarters: Stevens.

T. L. Smith Co., T-13—New 3 yd. Smith-Mobile truck mixer and agitator, a 14-S non-tilt mixer equipped with open end skip, a 10-S Trailsmith, and a 3½-S tilting type mixer equipped with batch hopper. In attendance: H. E. Smith, Pres.; H. C. Peters, Vice-Pres. in charge of sales; Fred Bager and F. B. Peterson, Sales Engrs.

Smith Engineering Works, R-1 — Model crushing and screening plant, No. 18 intercone crusher. Representatives in attendance: D. D. Barnes, G. L. Smith, A. L. Monro, H. H. Schaper, E. E. Kraig, Victor H. Jones, A. R. Amos, Jr. Hotel headquarters: Palmer House.

Solvay Sales Corp., U-1—Display will feature the use of Solvay calcium chloride for surface consolidation, plant mix and road mix. Also featured will be the use of this product for skidproofing ice-covered highways and for curing and accelerating concrete. Representatives in attendance: F. H. Kimber, G. P. Spencer, H. C. Todd, J. H. Elleman, H. R. Smith, E. N. McGee, C. Hook, A. Dorsey, G. Schroeder, M. Jordan, L. Reading, F. Harris, S. Taylor, R. Carson and J. Petrie. Hotel headquarters: Stevens.

Spicer Mfg. Corp., M-2—Helical gear transmissions, top mounted power take-offs, single and two-speed power take-offs, clutches, needle bearing propeller shafts. Representatives in attendance: R. E. Carpenter, Wm. Fairhurst, C. D. Peterson, E. A. Brown, R. V. Hessler. Hotel headquarters: Stevens.

Sterling Machinery Corp., O-10 — Pumps, hoisting equipment, generating plants, saw rigs and Drillmaster radial drill. Representatives in attendance: R. G. Barzen, R. C. Cameron, R. L. Smith and Don W. Smith. Hotel headquarters: Stevens.

Stover Mfg. & Engine Co., T-7—Industrial engines, gasoline and diesel. Representatives in attendance: Ben Avey, Lee Madden. Hotel headquarters: Chicagoan.

Sullivan Machinery Co., H-3—Portable and semi-portable compressors, rock drills, concrete busters, detachable bits, hoists, bit grinders. Representatives in attendance: H. T. Walsh, Vice-Pres.; W. R. Jarvis, T. F. Russell, O. J. Neslage, C. D. Smith, E. T. Hall, Geo. Bergman, R. W. Scott, C. H. Eichenlaub, H. A. Kindler. Hotel headquarters: Stevens.

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ROAD AND STREET COST DATA

A Compilation of Records of Methods and Costs of Construction Operations on Rural and Urban Highways.

By HALBERT P. GILLETTE

Author, Handbook of Cost Data. Editor, Roads & Streets

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Thew Shovel Co., G-8—New 1¼ yd. Diesel Lorain 69 shovel, new 1¾ yd. Lorain 80 crane, ¾ yd. Diesel Lorain 40A shovel with underfender chain crowd. Representatives in attendance: C. B. Smith, Vice-Pres.; D. G. Savage, Sales Mgr.; M. B. Garber, Sales Prom. Mgr.; J. L. Beltz, Adv. Mgr. Hotel headquarters: Morrison.

The Timken Roller Bearing Co., P-7—Display built around national advertising campaign, "Miles of Smiles," the central figure showing an attractive girl sitting on a large Timken bearing which rolls back and forth across the exhibit. Representatives in attendance: Various members of the industrial sales division. Hotel headquarters: Stevens.

Toncan Culvert Mfrs. Assoc., S-2—Toncan corrugated metal pipe, Toncan sectional plate pipe and arches, Toncan Corwel perforated pipe, Tyton sluice gates, Toncan triple-clad pipe. Representatives in attendance: A. J. Roof, E. W. Bauman, H. P. Pickering. Hotel headquarters: Stevens.

Trackson Co., Section C—Complete line of Trackson high shovels for "Caterpillar" track-type tractors, also one of the new Trackson side cranes. A new Trackson shovel for the D-2 Diesel-powered "Caterpillar" will be displayed for the first time. The improved Model SC4 shovel on a "Caterpillar" D-4 tractor will also be shown. In attendance at the Trackson exhibit will be W. H. Stiemke, Gen. Mgr.; L. E. Dauer, Sales Mgr.; H. J. McIntosh, L. M. Clark, I. W. Kunert, L. C. Frank and others from the sales and engineering departments.

Truscon Steel Co.—Truscon products for modern road building and reinforcement. A feature will be a unique method of directing attention consecutively to the various steel products in Tuscon's "Highway of Tomorrow." In charge of the exhibit will be C. B. McGehee, manager of highway reinforcing sales. Assisting him will be Reid Whieldon, promotional engineer, and H. B. Miller, E. W. Zimmerman, Louis Dusberger and E. J. Hugensmith. Hotel headquarters: Blackstone.

Tuthill Spring Co., W-4—Guard rail, adjustable support for reflector buttons. Representatives in attendance: H. T. Moore, W. S. Van Bergen, C. H. Pohl, W. S. Martin, C. W. Miller.

Union Metal Manufacturing Co.—Tapered monotubes used in construction of steel-encase concrete piles; also corrugated steel sheet piling (light weight), highway lighting standards and guard rail posts. Among those in attendance will be W. A. Porterfield, Vice-Pres.; D. B. Hanna, Gen. Sales Mgr.; M. B. Grant, Dist. Mgr.; A. H. Tashjian and J. R. Burkey.

Union Steel Products Co., 20—Principally the new Kwik-Lock road assembly unit for assembling materials that make up contraction and expansion joints in concrete paving. Representatives in attendance: D. H. Bitney, R. H. Deal, L. F. Emigholz. Hotel headquarters: Stevens.

United States Steel Corporation Subsidiaries, S-9, S-11—Large scale model of modern highway Cloverleaf. Subsidiary company products displayed as they appear in actual construction projects. Cooperating in this joint display will be American Steel & Wire Co., Carnegie-Illinois Steel Corporation, Columbia Steel Co., Cyclone Fence Co., Scully Steel Products Co., Tennessee Coal, Iron & Railroad Co. and Universal Atlas Cement Co., all subsidiaries of United States Steel Corporation. Representatives of these companies will be on hand at the exhibit at all times.

Universal Crusher Co., K-2A—Streamlined roller bearing crushers, a double roll crusher of the roller bearing type, new welded steel plate roller bearing swing hammer pulverizer, also pictures. Those in attendance: A. W. Daniels, L. W. Dunlap, L. S. Hackney, H. F. Rikhoff, R. D. Conway and F. L. Shramek.

Universal Power Shovel Corp., G-1—Unit 412 ⅜ cu. yd. full swing shovel. Representatives in attendance: H. E. Swanson, Chief Engr.; Harold E. Brey, Pres.; A. R. Corbett, Serv. Mgr.; J. W. Ralph, Northwest Dist. Mgr.; W. A. Grammer, Eastern Dist. Mgr.; R. W. Gill, Production Mgr., in charge of exhibit. Hotel headquarters: Sherman.

Vulcan Iron Works, W-7—Complete line of piledriver hammers and pile extractors. Representatives in attendance: Walter Daspit, Gen. Mgr.; C. V. Adams, Chief Mech. Engr.

The Earl Walker Co., Inc., W-8—Walker-Bar, a full circulating no drip spray bar for asphalt distributors. Representatives in attendance: Earl Walker, L. E. Fawcett. Hotel headquarters: Stevens.

Walter Motor Truck Co., N-6—Walter snow fighter, Walter road maintenance truck, Walter four-point positive drive tractor with Heil 16-yd. Dig-N-Carry scraper.

Waukesha Motor Co., W-6—One 180 h.p. oil engine power unit, one 125 h.p. oil engine power unit, one 180 h.p. oil engine, one 160 h.p. oil engine, one 140 h.p. oil engine, one 140 h.p. gasoline engine, one 50 h.p. oil engine. Representatives in attendance: J. G. Swain, Sales Mgr.; P. C. Ritchie, Adv. Mgr.; J. A. Mahoney, H. V. Kilpatrick, D. Cormack, L. J. Wilhoite, E. R. Rutenber, L. L. Bower. Hotel headquarters: Stevens.

The S. K. Wellman Co., N-2—Velvet-touch bimetallic clutch facings and brake linings for construction equipment. Representatives in attendance: S. K. Wellman, W. E. Canfield. Hotel headquarters: Stevens.

Wellman Engineering Co., H-6—Williams buckets, as follows: Lever arm type, multiple rope type and dragline type. Representatives in attendance: A. E. Gibson, Pres.; A. J. Lichtinger, Mgr. Bucket Dept.; W. C. Swalley, Sales Mgr. Bucket Dept. Hotel headquarters: Drake.

The Whitney Chain & Mfg. Co., U-22—Display background and samples, Whitney roller and silent chain drives, automatic sprocket release. Representatives in attendance: R. J. Howison, Sales Mgr.; R. W. Johnson, Mgr. Chicago Office; E. H. Huntington, E. W. Borrow, R. A. Glass, R. L. Mullaney, Chief Engr.; V. A. Hanson, E. N. Bidwell, Adv. Mgr. Hotel headquarters: Lake Shore Athletic Club.

Wico Electric Co., N-5—Customary show display plus a model of the new Wico Electromag. Representatives in attendance: E. L. Stoughton, Pres.; O. A. Powell, Sales Mgr.; V. K. Hunt, Sales Mgr., Trade Sales Div.; C. L. Allen, Serv. Mgr.; C. G. Waters, J. M. Jordan, Chicago office. Hotel headquarters: Stevens.

Willamette Hyster Co.—See Caterpillar Tractor Co.

Willett Manufacturing Co., M-14—New 1940 model power-reverse, power-tilting, power-rotating Willett truck-grader for road maintenance. Representatives in attendance: C. G. Willett, Mgr.; Frank H. Hirst, Chief Engr. Hotel headquarters: Stevens.

Wisconsin Motor Corporation, W-19—Seven air-cooled engines covering a range of from 1½ to 35 h.p. single cyl. and four cylinder sizes, and one 60-h.p. water-cooled power unit. Representatives in attendance: H. A. Todd, Pres.; Harry Cronk, Sales Mgr.; Phil Norton, Asst. Sales Mgr.; A. F. Milbrath, Vice-Pres. and Chief Engr.; Sales Representatives Irving LeBeau, Don Thom, Ray Fellows, Arthur Quade.

Gar Wood Industries, Hoist and Body Division, E-12—In addition to showing full-size hoist and body units, three working miniatures of hoist and body assemblies will be on display. Those in attendance: Gar Wood, Pres.; G. A. Bassett, Treas.; C. W. Wood, Mgr. of the Highland Park plant; L. S. Wood, in charge of engineering; R. S. Jenkins, in charge of manufacturing; W. H. Hammond, Sales Mgr., and C. D. Macpherson of the hoist and body division. E. B. Hill, Chicago branch manager, together with branch representatives, will also attend. Hotel headquarters: LaSalle.

Gar Wood Industries, Road Machinery Division, E-12—Scrapers, roadbuilders, bulldozers and tamping rollers. Representatives in attendance: Jack B. Haile, Gen. Mgr.; A. C. Berg, Asst. Mgr.; George D. Schaeffer, Chief Engr., and A. J. Adams, Sr., engineering consultant. District and field representatives who will attend are E. G. Hulse, Joe White, L. F. Buran, John T. Mitchell, Joe D. Brown, W. Duke Kerrick, Gil Koehler and Harleth Nelson.

Worthington Mower Co., T-20—Worthington tractor equipped with highway mower. Representatives in attendance: E. R. Sawtelle, Vice-Pres.; W. U. Roulette, Jr., Treas.; J. I. Blair, Chief Engr.; Frank P. Dunlap, Pres., Worthington Midwest Co., Glenview, Ill. Hotel headquarters: Palmer House.

Worthington Pump & Machinery Corp., P-5—Portable compressors, rock drills and air tools. Representatives in attendance: R. B. Hosken, delegate; P. A. Blakely, assistant. Hotel headquarters: Stevens.

GOOD ROADS MACHINERY CORPORATION

KENNETT SQUARE, PENNSYLVANIA

EXHIBITING AT THE ROAD SHOW

SPACE 0-9

ON THE GALLERY

Showing

LATEST DEVELOPMENTS IN
SNOW REMOVAL EQUIPMENT
ALL SIZES OF SAND SPREADERS
ROAD MAINTAINERS
CRUSHERS
QUARRY EQUIPMENT

MEMBERS OF OUR ENGINEERING STAFF WILL BE IN ATTENDANCE TO DISCUSS ANY PROBLEMS YOU MIGHT HAVE

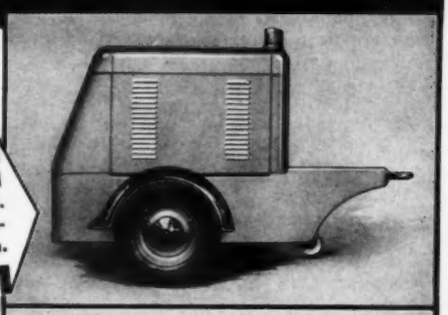
MEET OUR REPRESENTATIVES IN **SUITE 2100**
AT THE STEVENS HOTEL IN THE EVENING

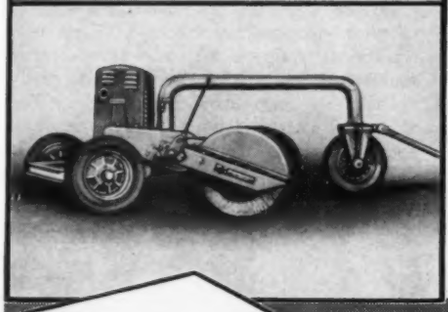
SALES and SERVICE FROM COAST to COAST

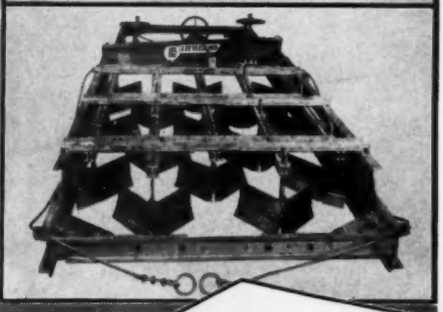
SEE THIS MONEY SAVING BLACK TOP EQUIPMENT

Here's the Littleford Pressure Distributor that gives more efficiency in operation, has single valve control. Uses spray bars up to 24' in width.

A new Littleford Unit, the Littleford Steam Generator, for heating tank cars. Produces steam in less than two minutes. Be sure to see this new item.







AT THE ROAD SHOW IN CHICAGO

If you are interested in NEW and IMPROVED equipment, designed to save money and time in operation, stop at the Littleford Booth H-9, J-4, J-5, J-6, at the Road Show—see and hear about the New Units in the Littleford Line and the startling improvements on the old. We invite you to stop and see us; we know it will be worth your time.

Still another new Littleford Unit—the Road Broom. Strong, sturdy, easy to trail and fast in operation. It is designed to do a better job, and engineered to revolutionize the method of cleaning an old road surface.

BLACK TOP ROAD MAINTENANCE EQUIPMENT — LB — SINCE - 1900

LITTLEFORD

LITTLEFORD BROS.
454 E. Pearl Street, Cincinnati, Ohio

The Littleford Bituminous Resurfacer is the unit that makes a new mixed-in-place surface in one pass. You save the cost of this unit the first time you put down a few miles of new surface. It's the simplest, yet the most thorough resurfacing unit ever designed.

RECENT EQUIPMENT DEVELOPMENTS

Much of This Equipment Will Be at the Road Show

New Self Propelled Earth Moving Equipment

A new, high-speed, self-propelled unit for moving earth on road, dam and other large scale construction projects was announced late in the year by the Galion Iron Works & Mfg. Co., Galion, O. This new piece of equipment will be shown for the first time at the Road Show. Rated capacity is 15 cu. yds. Power is furnished by a 6-cylinder diesel engine of 100 h.p., which operates on less than 3 gallons of fuel oil per hour. The unit has a quick

Cyclone Earth Mover.

get-away and fast road-ability (up to 25 miles per hour) and a short turning radius of 15 ft. Steering, brakes and clutch are air controlled. Other operations are by finger-tip hydraulic control. Scientific distribution of weight with drive in rear provides satisfactory flotation on soft dumps and fills. Two of the three large pneumatic-tired wheels are powered to reduce rolling resistance to a minimum.

▼

New Test Drill Rig

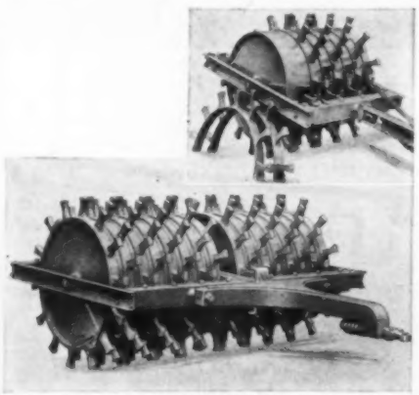
A portable test drill rig brought out by the Four Wheel Drive Auto Co., Clintonville, Wis., is a combination outfit designed for churn drilling, rotary boring and for operating an improved type of soil sampler. The rig will be featured in the FWD exhibit at the Road Show. The test drilling rig, mounted on an FWD four-wheel drive truck, is so mounted that by disconnecting six U-bolts it may be quickly detached and moved onto a barge for drilling over water, or skidded to difficult boring locations on steep hillsides. The equipment can also be readily rigged for driving light piles into marsh lands or river beds whenever a temporary trestle or working platform is required to reach such inaccessible locations. All drill units are mounted in a welded box type steel frame constructed from heavy channels. The power unit is independent of the truck and consists of a gasoline power unit with a 5-speed truck transmission mounted in an industrial conversion unit. This provides ample power and flexibility with the gear ratios to meet all operating requirements for the various types of drill tools.

FWD Combination Foundation Drilling Rig

▼

New Tamping Roller

New tamping rollers with the feet welded on bands, making both bands and feet removable from the drums, were introduced by J. D. Adams Co., Indianapolis, Ind. The rollers are offered in single and double drum models which can be hooked up to be operated in train as desired. The removable foot feature not only permits easy and economical replacement of worn-out feet, but permits applying various sizes of feet to the drums to meet special conditions. The drums are 44 in. in diameter and can be filled with water or sand for ballast. Because of the larger diameter of drums it is said that these rollers offer a wider than usual range of foot pressures to meet varying specifications, and that pressures as high as 375 lbs. per square inch of foot area can be obtained.



Adams Tamping Roller.

New Trail Dump Wagon

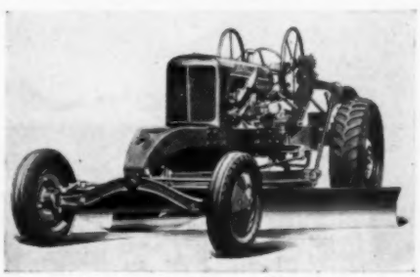
A new model trail dump wagon was announced by The Euclid Road Machinery Co., Cleveland, O. This is a powerful 200 h.p. unit equipped with 24.00x32 tires, or optional 18.00x40 tires. It has a truck measure capacity of 18 cu. yd. or a heap load capacity of 20.75 cu. yd. on a 3:1 slope. Its top speed is about 25 m.p.h. Although of conventional Euclid bottom-dump design and construction, the Model LDT-63W Euclid has two important improvements. The rear axle is stated to be the largest of its type ever made. It is of the full-floating Euclid planetary type with a total reduction of 25.68 to 1. The dumping doors are air powered and operated. A valve on the steering column opens or closes the doors while the Euclid is either moving or stationary. This new Euclid will be shown for the first time at the Road Show.

New Model LDT-63W Euclid

▼

New Low-Cost Motor Grader

A new low-cost motor grader—the W-Speed Patrol—was announced by Allis-Chalmers Manufacturing Co., Milwaukee, Wis. This new machine has been designed to handle, at a minimum cost, all road maintenance, average construction work and light ditching. The long wheel base (120 in.), wide front axle and the grader type blade and drawbar enable this unit to build and clean ditches—making it a ditch to ditch maintenance machine. This new machine is equipped with a 10 ft. reversible moldboard. The lifting mechanism is easily operated by two large handwheels. The W-Speed Patrol is powered by a medium speed 4-cylinder tractor engine developing



New Patrol Grader

A GRACIOUS HOST FROM COAST TO COAST

IN NEW YORK..

The Gotham

IN CHICAGO..

The Drake

The Blackstone

IN LOS ANGELES..

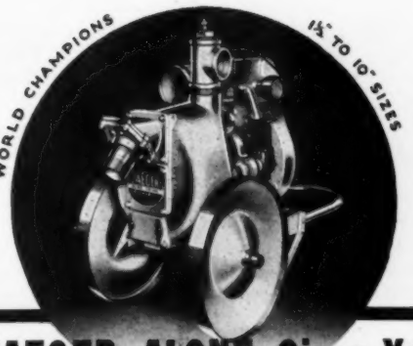
The Town House

IN BELLEAIR, FLA..

Belleview Biltmore

A. S. KIRKEBY, *Managing Director*

KIRKEBY HOTELS



JAEGER, ALONE, Gives You All These Pumping Features

- JAEGER "PRIMING JET"—Up to 5 times faster priming and re-priming—often means difference between profit and loss on job. No adjustments—no need to "gun" engine.
- POSITIVE RECIRCULATION CUT-OFF — It's controlled by flow, not pressure.
- "FULL-RANGE" IMPELLER gives high efficiency under all conditions (built of steel in 4" to 8" sizes).
- ACCESSIBLE SEAL — always outlasts the impeller.
- PATENTED SELF-CLEANING SHELL—scours while pumping, won't clog, easily accessible.
- DEPENDABLE, LONGER LIFE CONSTRUCTION — thousands of EXTRA hours of service.
- EVERY PUMP INDIVIDUALLY TESTED for capacity and pressure before it leaves our factory.

OUTSELLS EVERY OTHER PUMP

Send for New Catalog and Prices
THE JAEGER MACHINE CO.
223 Dublin Avenue - Columbus, Ohio

JAEGER "Sure Prime" PUMPS

Load 'em and Lug 'em

LOAD LUGGER

Brooks new Model "CH" is the greatest dump-truck that ever "came down the pike," say highway engineers who have seen the 1940 Load Lugger at work on hand loading jobs.

It hoists, hauls and dumps . . . operating with 5 to 10 buckets. Lugger unit mounted on 1½-ton truck easily handles 2-yard bucket. Keeps going all day, picking up load while men fill empties . . . no waste time, no idling trucks, no expensive equipment.

Use Load Luggers on road construction and repair work . . . they boost production and cut costs. Read all about them in new Bulletin . . . send for your copy.

Will See You in Booth Q-3 at the ROAD SHOW

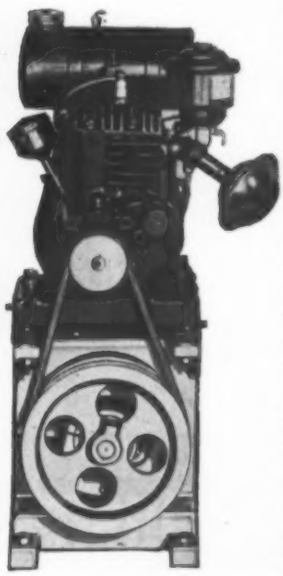
BROOKS EQUIPMENT & MFG. CO.
48 Davenport Road Knoxville, Tenn.

31 h.p. at 1,300 r.p.m. The drawbar and the belt pulley are free to do numerous other jobs. Electric starting and lights are standard equipment.

▼

Hydraulic Power Pump for Snow Plows

A new hydraulic power pump for use with the lighter snow plows and road building equipment where cost is a paramount factor was developed by the Blackhawk Manufacturing Co., Milwaukee, Wis. This Blackhawk gasoline powerpacker is powered by a Briggs & Stratton gasoline engine of capacities of ¾ h.p. or 1½ h.p. By using the smaller motor, a pressure of 1,000 lb. per square inch can be obtained with this unit. In using the larger motor, 2,000 lb. per square inch can be obtained. In this way, it is very simple to make changeovers of hand hydraulic controls on present snow plow equipment, since in most cases the same ram and hose line can be used. This unit can be conveniently mounted on the runningboard, or between the dump body and cab of the truck itself, with hose lines running to the cab for the valve and from there on to the ram. The number of rams can be controlled by using a series of valves located in the cab.



Self-Motorized Pump

▼

New Scrapers

Several new Carryall scrapers were added to the line of R. G. Le Tourneau, Inc., Peoria, Ill. These included Model W, a large pusher loaded scraper of 23 cu. yd. heaped capacity; the Model P, an 11 cu. yd. unit; the Model SU, a 14 cu. yd. unit, and the Model A Tournapull and Tournatrailer. The Tournapull is available with either the 30 yd. Carryall scraper or the 30 Tournatrailer. It is powered by a 160 h.p. Caterpillar diesel engine. The Model SU is a double bucket, cable controlled Carryall scraper rated at 14 cu. yd. struck capacity and 18 heaped. The scraper is designed to give maximum capacity for loading under normal conditions without the aid of a pusher and thus to completely utilize tractor power. To minimize loading effort and make the greater yardage possible the scraper blade is narrowed to 8 ft. 6 in., and a patented double bucket bowl used. The narrow cutting edge and two telescoping buckets give the effect of loading successively two small scrapers with a large tractor. After loading the first bucket to capacity, it is drawn back while the second is being loaded. This double bucket loading method is designed to eliminate costly voids in the rear of the bowl and at the top of the tailgate.

Model SU Carryall Scraper

▼

Byers Develops New Shovel

A ¾ yd. streamlined gas or diesel powered shovel, with chain or cable crowd optional, will be displayed at the Road Show by The Byers Machine Co., Ravenna, Ohio.

Byers Streamlined ¾ Yd. Shovel

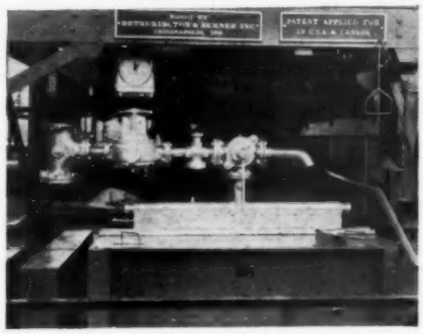
It is called Byers 1940 Model 83 and will be located just inside the front door in Booth G-11.

Main frames and shovel booms on this ¾ yd. are of oxyograph torch cut, die formed and electrically welded rolled steel plates of thicknesses up to 2½ in. Weight of the "83," as a shovel, is 36,000 lb. Ball and roller bearings carry all major shafts and friction clutch discs. Drive from the 72 hp. 6 cyl. motor is through silent chain, enclosed and running in oil. Construction details to be emphasized are two-speed crawler, electric starter and mechanical dipper trip as standard equipment. Other features include self-cleaning treads, 72 hp. motor, positive independent low speed crowd with hi-speed retract on shovel, 170 fpm hoist line speed and ability to hoist and swing while traveling and steering.

▼

Automatic Metering of A-C Measurements

An automatic precision device for accurately measuring the precise quantities of ingredients in asphalt-cement mixes, the Fluidometer, is announced by the Brayer Instrument Co., Buffalo, N. Y. It eliminates the "bucketing" operation and affords a dependable method for conveying directly and without human attention the precise quantity of A-C into the mixer. The Fluidometer is suited to present mixing plants and can be adapted to hot or cold mixing, using petroleum or native asphalt cement or other binding agents. Operation is simple. The push of a button switch opens a Solenoid valve starting A-C flowing through the meter. The meter drives the control mechanism which can be preset on an indicator to the exact quantity desired. The A-C is metered with a maximum variation of less than one-half of one per cent. One of these units will be on display in Booth K-1 of Hetherington & Bernes, Inc., Indianapolis, Ind., who are the sole distributors for the Fluidometer system on bituminous paving plants.



The Fluidometer

▼

New Diesel Crawler Tractor Line

A new line of high speed Diesel crawler tractors, powered by General Motors Diesel engines, was announced by Allis-Chalmers Manufacturing Co., Milwaukee, Wis. The first of this new line—the HD14—develops 130 h.p. on the belt, 106 h.p. on the drawbar, and weighs 27,000 lb. The transmission with six forward speeds and two reverse provides forward speeds from 1.72 to 7.00 miles per hour and reverse speeds of 2.00 and 3.20 miles per hour. The General Motors 2-cycle 6-cylinder engine makes possible throttle control of a tractor, giving a range of speeds in any gear down to half rated engine speed, without loss of drawbar pull. Other features include the use of the new "Positive Seal" truck wheels, recently introduced by Allis-Chalmers, which eliminates the regular 10 hour greasing and requires lubrication only once every 200 hours. New and revolutionary steering clutches and brakes of a bi-metallic material are used which

New HD14 Tractor

ROGERS BROTHERS CORPORATION
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in a ROGERS trailer

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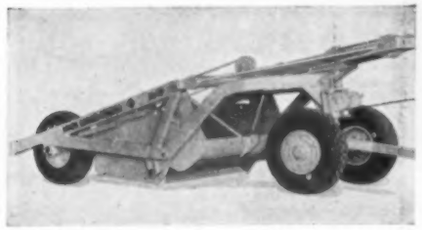
COLUMBIA, PA.

are said to make a marked reduction in maintenance expense by increasing the life of these parts many times. Standard equipment on the HD14 includes heavy radiator guard, heavy full-width crankcase guard, heavy truck wheel guards, front pull hook, and muffler. Radiator shutters and electric starting are also standard equipment.

▼

New Hauling Scrapers

A new and improved line of hauling scrapers was announced by J. D. Adams Co., Indianapolis, Ind. Three new models are available—the No. 30, of 3 yd. capacity, to be worked with 30 to 40 h.p. tractors; the No. 50, with 5 yd. capacity, for tractors of 40 to 60 h.p., and the No. 100, with 10 yd. capacity, for use with tractors of 70 to 80 h.p. The scrapers are double-cable controlled, being operated from a winch or hoist attached to the rear of any crawler tractor and operated by the tractor operator. In addition to their ability to load quickly and dump readily, the manufacturer claims operating and mechanical advantages in the following: Weight distribution which puts approximately equal weight on all four wheels when scraper is loaded. Four large, low-pressure tires which provide excellent flotation with easy draft over soft material. Extraordinary clearance under bowl and axles for clearing dumped loads. Low bowl pivot point which maintains uniform blade position in spreading and provides low center of gravity. Double-cable control provides positive control of depth of spread, independent control of apron for loading or spreading and permits leveling pits, dumps and runways with bowl carried in dump position. Pusher bar may be mounted across rear of frame as optional equipment.



Adams Hauling Scraper.

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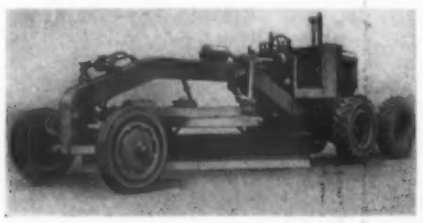
New Motor Grader

A new motor grader, No. 201, was announced late in the year by the Galion Iron Works & Mfg. Co., Galion, O. This is a companion machine of the big heavy-duty grader shown for the first time during the 1937 Road Show. Both of these units will be on display in the Galion booths during this year's road show. The No. 201 is powered by a 46 h.p. gasoline engine mounted over rear axle, and has full hydraulic, finger-tip hydraulic control. It has a full size blade with a full range of adjustments in all working positions.



Galion No. 201 Grader.

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New Developments in Road Building Equipment

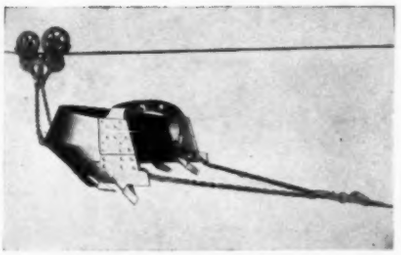
Important advances in equipment for laying both bituminous and concrete pavements will be featured in the 1940 Road Show exhibit of The Jaeger Machine Co., Columbus, O. Among these will be Jaeger's 1940 model bituminous paver equipped with automatic leveling device which, without the use of forms, is said to lay material to grade line as accurately as though forms were set. Other new features, in addition to this automatic leveling, include full crawler traction and heated screed designed for both oscillation and compaction. In the concrete field is the Jaeger re-mixing concrete spreader, equipped with reversible spreading screw and adjustable strike-off. Eleven of these units are being used on the Pennsylvania turnpike to remix, spread and strike off base ready for laying steel, and top ready for the finishing machine. Use of the spreader is stated to have been found to eliminate segregation and "bottle-neck" due to hand shovelers in the pit as the spreader re-works the material and spreads it. Five new road-laying features will be demonstrated in Jaeger's 1940 model automatic finisher. For road-mix operations, both stabilization and bituminous re-tread, Jaeger will exhibit its latest type Mix-in-Place road builder designed to mix up to 180 cu. yd. an hour in windrows up to 16 cu. ft. size. Water and bitumen measuring equipment and belt attachment for re-windrowing mixed material behind machine will be shown.

Jaeger Re-mixing Concrete Spreader

▼

Developments in Drag Scraper and Slackline Machines

A number of interesting developments were made in 1939 by Sauerman Bros., Inc., 488 S. Clinton St., Chicago, Ill., in their line of drag scrapers and slackline machines for excavating and stock-piling service. New designs of two-wheel and four-wheel carriers were perfected for use in adapting the larger sizes of Sauerman Crescent scraper buckets for slackline operation. These new carriers have cast steel housings, alloy heat-treated sheaves, and in certain sizes are equipped with Timken roller bearings. With the single-wheel and two-wheel carriers previously developed, the Sauerman line now includes specially designed carriers for every size of Crescent scraper bucket from the ⅓ cu. yd. to the 15 cu. yd. The development of remote control systems for Sauerman scraper and cableway hoists has been carried further during the last year, with the result that users of these machines now have the choice of four different systems of operating their scraper or cableway hoists, namely, (a) remote motor operated oil hydraulic control; (b) remote electric control through torque motor; (c) hand lever control with levers located in elevated quadrant; (d) hand lever control with levers located alongside the hoist. A further improvement in Sauerman scraper and cableway hoists is the design of additional sizes of roller bearing units. Roller bearing hoists now are available for operating any size of scraper from ⅓ cu. yd. to 5 cu. yd., inclusive, and for any size of slack-line cableway excavator up to and including the 2 cu. yd. machine.



Sauerman Crescent Scraper of 3 Cu. Yd. Capacity with New Design of 2-Wheel Carrier

▼

Improved Lima Line

The Lima Locomotive Works, Inc., Shovel and Crane Division, will exhibit a ¾ yd. Paymaster shovel and a Type 750 dragline in Booth G-5 at the 1940 Road Show. Both of these machines incorporate the same high quality of material and workmanship of which Lima has always been proud, coupled with up-to-the-minute engineering skill and design. The Type 750 shovel is equipped with a dipper of full 1¼ cu. yd. capacity with a 22 ft. 0 in. boom and 17 ft. 0 in. dipper handle. Draglines are equipped with booms ranging from 50 ft. to 80 ft., the size of the bucket varies, depending upon the weight of bucket and class of material to be handled. Cranes are also equipped with booms ranging from 50 ft. to 80 ft.

Lima Paymaster Convertible Shovel

17 YEARS
LEGIBLE SIGN SERVICE

Furnished with 3" O D Steel Post

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"Municipal" Street Signs are standard in Cities, Towns and Villages.

Inquiries invited from Equipment Distributors.

Send for literature on other types of Street and Traffic Signs.

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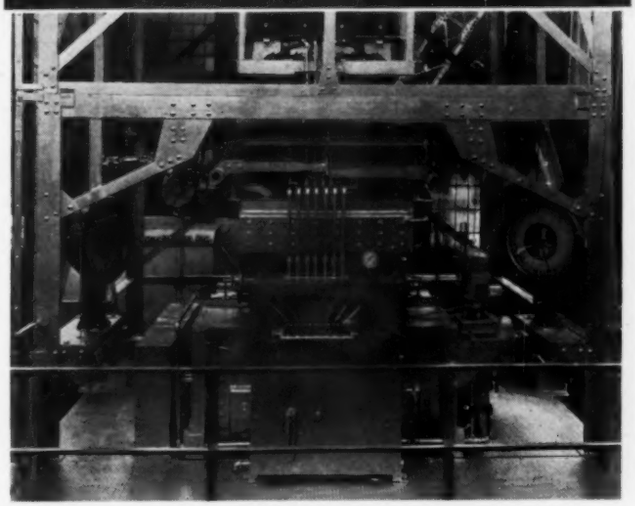

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William Hamilton
MANAGING DIRECTOR

Howard E. Biggs
CONVENTION MANAGER

The Ambassador
IN ATLANTIC CITY

The manufacturer states that the user whose work requires a small excavator of large capacity that will get things done smoothly, swiftly and economically, will welcome the Lima Paymaster convertible shovel, dragline, crane and pull-shovel. The Paymaster is a ¾ cu. yd. shovel, weighing 35,500 lb. When equipped as a crane, it has a 12 ton capacity. It is fast, with ample strength to give steady dependable service in all kinds of work suited to a machine of ¾ yd. capacity. As a shovel, it is equipped with an 18 ft. boom and 15 ft. dipper handle. Standard crane boom is 35 ft. However, inserts can be added to make a 50 ft. boom. Many new features which are worthy of consideration are found in its design; for instance, greater lifting capacities; pintle cast integral with base; anti-friction bearings, including drums; one-piece rotating base casting; internal expanding band type main clutches; double cone, friction type, amply ventilated swing and travel clutches; modern welded construction; six-point connections on treads; independent boom hoist; chain or cable crowd; all-steel box type welded boom; single seamless type 7 in. diameter dipper handle; multiple roller chain power take-off; ample vision, in-built winter front, streamlined cab.

▼

New Heavy Duty Rooter

An extra-heavy duty rooter of radically new digging design was brought out by R. G. Le Tourneau, Inc., Peoria, Ill., designed for breaking up tough material for faster, more efficient scraper operation. The center tooth is set ahead of the others and is claimed to gain quicker penetration to a maximum depth of 29 in. Simple "T" construction of all-welded box beams gives great strength. Hard-surfaced, self-sharpening teeth, shaped for natural digging suction, insure easy penetration, long life. Single cable operated to apply full tractor engine power to the rooter lift for rock and stump removal. Bumper frame, mounted on the rear, gives the added advantage of the use of a pusher tractor in very tough conditions and greatly increases the weight for effective digging.

Model K Extra Heavy Duty Rooter

▼

New Whiteprint Machine

A new model Ozalid whiteprinter has recently been announced by the Ozalid Corporation of Johnson City, N. Y. This

Model A Ozalid Whiteprinter

Model A was designed for high speed production of Ozalid whiteprints and it is stated it will produce finished prints ready for immediate use at a maximum rate of 20 lin. ft. per minute. This machine incorporates both exposing and dry developing in a single compact unit. It is claimed to feature many innovations new to the technical reproduction field, including vacuum separation of tracing from print before development, operator control of light source for energy economy and continuous speed printing regardless of tracing variation and rewinding mechanism for continuous roll stock.

▼

Improvements on "Flex-plane" Finisher

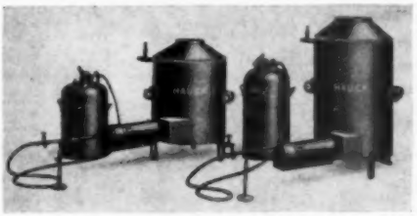
The 1940 improvements on the Flex-plane finisher of the Flexible Road Joint Machine Co., Warren, O., include the following: Sectional Screed: The 20 in. wide screed is made in two equal sections—the front section can be raised to allow enough dry, fluffy concrete to pass under the rear section to give a superior surface. Direct starter springs—on each end of the screed. These starter springs store up pressure so that when the screed starts the spring will actually start the screed itself without throwing the load or pressure against the forms, eliminating practically all the so-called side-weaving of the finishing machine. Leaning Screed Wings: These prevent the concrete from flowing over the forms. They are built with the unit leaning inwardly so the concrete cannot pile up against the screed wing to any appreciable height. Another improvement is the option of pneumatic-tired wheels.

Flex-plane Finishing Machine

▼

New Water Heater

One of the latest developments of the Hauck Manufacturing Co., 119-129 Tenth St., Brooklyn, N. Y., was a new line of portable water heaters for heating large quantities of water in cold weather for concrete mixers and central mixing plants. These heaters combine three important construction features—water jacketed shell, inverted conical double heating coil, tangential heating method using torch type heating burner. This improved design and added heating surface is claimed to heat the water more quickly with less fuel. The heaters are furnished in two sizes. The large No. 309 Hauck water heater is stated to heat a maximum of 1,660 gal. of water per hour with a 50° F. temperature rise. (Water heated from 40° F. to 90° F.) Minimum of 600 gallons heated water per hour with a 140° F. temperature rise. The smaller size No. 308 Hauck water heater is stated to produce 1,250 gal. heated water per hour with a 50° F. temperature rise or 450 gal. water per hour with a 140° F. temperature rise. Hot water 2 minutes after starting, continuous thereafter. Requires only 5 minutes to put heater in operation.



Hauck No. 308 and No. 309 Portable Water Heaters

▼

New 90 Horsepower Diesel Truck Engine

A 90 hp. diesel truck engine, just announced by the Caterpillar Tractor Co., Peoria, Ill., marks the entry of that concern into the automotive field. For replacement installations, the Model D468 engine is offered as a complete unit, equipped with a five-speed Spicer No. 5351 transmission, and clutch. The engine is a six-cylinder, four-stroke, valve-in-head, water-cooled model with a bore of 4¼ in. and a 5½ in. stroke. Maximum horsepower is developed at 1,800 r.p.m. Maximum torque is 305 pounds-feet at 900 r.p.m. Piston displacement is 468 cu. in. The engine fuel system features solid injection into precombustion chambers. All injection pumps and valves are set at the factory and require no adjustment in the field. Pistons are of aluminum alloy. The cylinder head, the block and the crankcase unit are in cast alloy iron. Water circulation is by pump, with the operating temperature of the water controlled by

LA CROSSE *Heavy Duty* TRAILERS

The most complete line on the market. Capacities, five to two hundred tons. Four to sixteen wheels. Two to eight axles. They are built to take the heaviest loads safely, and with the least damage to road beds. Write today. Just tell us what you have to move.

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SUPER WORKMAN

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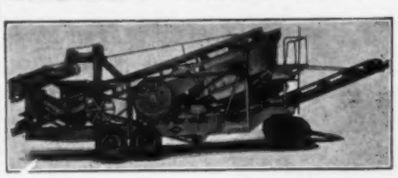
ROAD SHOW Booth E-9



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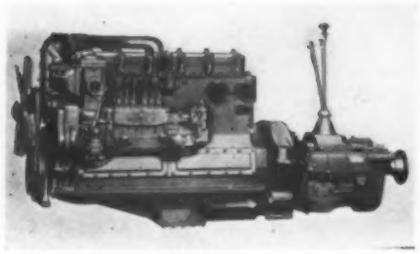


Caterpillar Diesel Truck Engine

thermostat. There is an air-cooled type lubricating oil cooler provided. There are seven main crankshaft bearings, with a total surface of 118 sq. in. Connecting rod bearings are of 2⅝ in. diameter and are 1⅞ in. in length. There is a crankshaft torsional vibration damper. Lubrication is by pressure to all main and connecting rod bearings, piston pin bearings, camshaft bearings, valve operating mechanism and timing gears.

▼

New Subdrainage Pipe

A new subdrainage pipe (Toncan Cor-Wel pipe), brought out by the Toncan Culvert Manufacturers' Association, Republic Building, Cleveland, O. The pipe is helically corrugated, having a continuously welded longitudinal seam. It has a nominal inside diameter of 6 in. and is available in either 18 or 16 gauge and in any length up to 24 ft. The pipe is furnished either perforated or non-perforated. The perforations are placed in the inside crests of the corrugations; six longitudinal rows are usually located in the bottom of the pipe. Fittings of all types, such as tees, ells, wyes, crosses, and reducers, may be obtained either perforated or non-perforated. End caps and outlet screens, made for quick installation, are carried in stock. Connecting bands of simple design are used for joining together sections of pipe and fittings. The pipe, both perforated and non-perforated, connecting bands, fittings, screens, and end caps are galvanized by the hot-dip process after complete fabrication with a zinc coasting of not less than 2 ounces per square foot of double exposed surface.

▼

New Pressure Distributor and Tank Car Heater

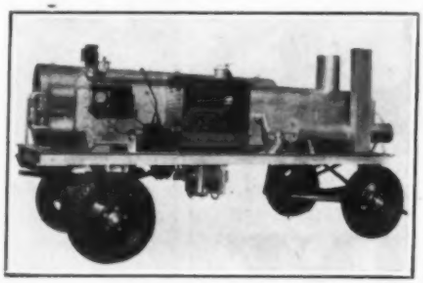
Among the several new products announced for 1940 by Littleford Bros., Cincinnati, Ohio, are a tank car heater and a pressure distributor. Claim is made by the manufacturer that the tank car heater will produce steam in two minutes from the time it is started, uses little fuel and will clean as well as heat. The new pressure distributor is made in sizes from 500 gal. to 300 gal. Spray bars up to 24 ft. can be used. It is made in truck mounted or semi-trailer design. It combines the continuous heat flue system, pressure burner, instant cut-off spray bar, pump and valve heating chamber, pneumatic tired trachometer, single valve control, etc.

Littleford Pressure Distributor Tank Car Heater

▼

Tank Car Heater

A circulating booster for heating tank cars of asphalt was placed on sale throughout the United States the early part of 1939, by W. E. Grace Mfg. Co., Dallas, Tex. A steam generator is mounted on the same trailer with the booster unit, which may be operated independently, but when mounted with the booster uses the same motor, blower and fuel pump. The booster heater unit employs a positive stirring action to the asphalt while heating.



Rapid Fire Circulating Booster.

The asphalt is forced through an annular space between two concentric flues, in which space is placed a spiral fin welded to the inner flue. The fin aids considerably in heat transfer and keeps the asphalt traveling spirally around the flue, maintaining a uniform rate of flow over all parts of the flue. The flue assembly is readily removable and so constructed that no expansion strains are set up. A 4 in. Kinney pump and suction line is regular equipment, delivering a maximum of over 200 GPM. Precision dial type thermometer, automatic cutoff of burners when excessive temperature is reached, and large tool box are other features. The booster will be on exhibit at Booth T-15 at the Road Show.

▼

New Tractor Sweeper

A new tractor sweeper for use with Allis-Chalmers Model IB tractors, was announced by the Frank G. Hough Co., Libertyville, Ill. This unit, because it features a short sweeping path and lighter weight, is suited for skating pond and sidewalk snow sweeping and cleaning walks, ramps, platforms, etc., in parks, industrial plants and material yards. Claimed operating features include efficient sweeping, a quick, easy lift of the broom, readily adjusted ground pressure, minimum broom wear and simple attachment and detachment from the tractor. The IB sweeper cleans a 60-in. path and is furnished with dust hood which is readily removed for snow work. Broom operates in self-aligning bearings and is

The Hough Tractor Sweeper

chain driven through a ratchet type clutch. Gear boxes are ruggedly made and fitted with hardened cut steel gears and ball and roller bearings. Heavy duty roller chains and hardened sprocket wheels are used for the final drive which is protected by a guard.

▼

Improved Finishing Machine

The D-K spreader and finishing machine of the Shunk Manufacturing Co., Bucyrus, O., can now be furnished as a self-propelled unit. Many other improvements have been added to the 1940 model. The new D-K spreader and finishing machine is designed for new construction of bituminous bases and surfaces, as well as re-surfacing. All of the many important features of the 1939 model have been retained. The D-K will automatically spread and lay to grade in one operation, and levels without forms.

▼

Engine-Driven Welder

A new 200-ampere engine-driven arc welder is announced by The Lincoln Electric Co., Cleveland, Ohio. The new welder, designated the SAE-200 J, is light enough to be wheeled readily by one man, or lifted easily on its single balancing hook by average moderate-capacity chain or crane falls, it is claimed. The weight is under 900 lb. Ease of moving and handling the unit is further enhanced by its size, which also shows to advantage in the matter of floor space. The SAE-200 J meets requirements for a wide range of applications for direct current arc welding, it is claimed. It welds light-gauge metal by the metallic arc process; also car fenders, bodies, and galvanized sheet by the carbon arc method; repairs cast iron parts such as cylinder heads and blocks; fabricates a wide variety of equipment; does hard facing, and is effective in countless other applications. It produces a uniform current for speedy welding of practically all metals and alloys with either bare or shielded arc type electrodes. The gasoline engine is 4-cylinder

Welder with Covers Open

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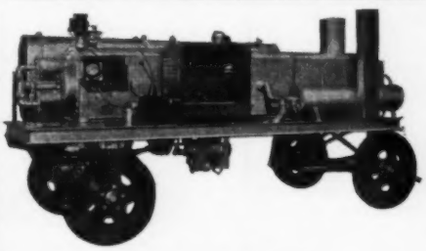

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A comprehensive compilation, in book form, by Victor J. Brown, of logically correlated information, data, etc., on the theory and practice of soil stabilization in the highway field. The subject matter originally appeared as a series of articles, by the compiler and others, in ROADS AND STREETS.

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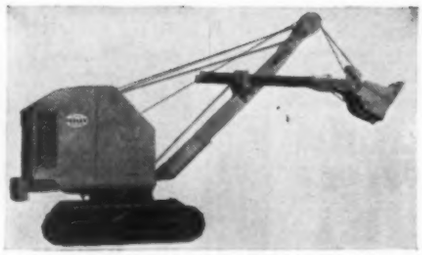
type, 3-in. bore and 4-in. stroke with piston displacement of 113 cu. in., capable of delivering 26 hp. at 1,800 r.p.m., the speed at which the unit is operated. Fuel tank capacity is 8 gal., enough for about one day normal operation. The Lincoln Junior is available as a portable unit with steel-wheeled running gear, shop type and as a stationary unit, either for fixed mounting in the shop or for installation on a truck or trailer.



Insley Type K Excavator.

Improve Insley Excavator

An improved Insley Type K excavator will be shown for the first time at the Road Show by the Insley Manufacturing Co., Indianapolis, Ind. The shovel has an independent chain crowd. Efficient internal expanding clutches minimize the internal friction. Larger clutches on the hoist drum and digging drum have 42½ per cent greater friction area and 65 per cent increased efficiency. The larger clutches on the swingers have 20 per cent greater friction area and 30 per cent increased efficiency. Larger brakes with a high ratio brake operating mechanism constitute another outstanding feature of the improved Type K Excavators. These larger brakes on the hoist drum and digging drum provide 12½ per cent greater friction area.

Longer life is assured through an improved pressure lubrication system, and the fully enclosed horizontal gears running in an oil bath. Crawler driving gears have also been enclosed and run in oil.

Loader and Finisher

Among the various machines of the Austin-Western Road Machinery Co., Aurora, Ill., on display at the Road Show will be the "99" loader and the "99" finisher. The first mentioned was designed to provide a quick and cheap method of trimming down high sod shoulders on paved roads or picking up waste material from ditches or roads and loading it into trucks. The finisher, it is claimed, can finish slopes of 14 ft. or more. Its extra blade can be adjusted from vertical down to and below

Finisher and Loader.

the horizontal. Windrow is deposited behind rear wheels. The sloping blade rotates around a fixed heel pivot. The outer end is raised or lowered by hydraulic power. The heel of the slope blade can be set to give 10 inches clearance for the waste windrow, or it can be lowered to ground level.

Walter Tractor for Scraper Service

The Walter four-point positive drive tractor of the Walter Motor Truck Co., Ridgewood, Queens, L. I., N. Y., is now being offered for dirt moving service with

SILVER KING

Years of experience and hundreds of owners prove without a doubt, the Silver King Highway Mower does an outstanding job the year around. In addition to the annual Spring-to-Fall weed mowing job, it is an ideal maintenance unit. It is also used for leaf removal in the Fall, snow removal in the Winter. Cities, counties and states all find the Silver King the first practical all-purpose mower. Without obligation, send for the Silver King Bulletin, "For Year 'Round Economy."

★

THE FATE-ROOT-HEATH COMPANY
PLYMOUTH, OHIO

Send for this FREE FOLDER!

scraper. The tractor embodies the characteristic Walter features: Automatic lock or torque proportioning differentials, giving a positive drive to all four wheels with all operating conditions; suspended double reduction drive; powerful motors—diesel or gasoline fuel; tractor type transmission with six forward and two reverse speeds, single lever control; set-back front axle with cab forward, giving short wheelbase

Walter Tractor with 16 Yd. Scraper

with quick turning and proper weight distribution. The tractor will be on exhibit in Space N-6 at the Road Show.

▼

New Model of "Load Lugger"

An improved Model "CH" of the Brooks load lugger was put in production by the Brooks Equipment & Manufacturing Co. of Knoxville, Tenn. This is an entirely new design. It is easily mounted on any standard chassis. Correct load distribution, well forward of the rear axle, eliminates excessive strains on the chassis and is stated to enable a 1½-ton truck to carry a fully loaded 2 cu. yd. bucket. A unique jackleg device, attached to the rear end of the load lugger frame, relieves the truck chassis of the overhanging load when the bucket is being raised, and makes counterweights unnecessary. This jackleg adjusts itself to ground level, and is operated from the driver's seat. The hoisting mechanism is operated by a simple

New "Load Lugger"

power take-off from the truck engine. The hydraulic hoist is a heavy-duty double-type unit which raises or lowers both bucket-booms at once. Less than 20 seconds is required for raising, dumping or lowering the load. The oil pump and control valves are fully enclosed in a compact unit and mounted under the deck plate, permanently protected. Simplified control is a feature of the new load lugger. The driver handles all operations from the cab, using one lever for controlling the oil valve of the hydraulic hoist and for engaging the dumping hook in discharging the bucket.

Portable Service Station

A new portable lubricating service unit was announced recently by the Alemite Division of the Stewart-Warner Corp., Chicago, Ill. The Alemite portable service station unit is complete in every detail, and can be installed in a light delivery truck. A variety of set-ups are available to fit different needs. The power pumps are air operated and are designed and built for heavy duty field lubrication service. The lubricant is pumped direct from original 400 lb. drums. All pumps are compactly constructed with working parts enclosed. Provided with long hose assemblies, complete with control valves and swivels. Any two-stage air compressor with 2 hp. gasoline motor and displacement of 6 cu. ft. per minute may be used with the Alemite portable service station. Can also be used for filling tires, spraying paint, cleaning motors, etc. Only seconds are required to

The Alemite Portable Field Service Station

FOR THE TOUGHEST HAULING JOBS

On and Off the Highway

• Jobs seldom come too "tough" for Marmon-Herrington *All-Wheel-Drive* Fords. If there's any "bottom" to the mud they'll pull through. Loose sand can't stop them. Hills have to be almost "straight up" or they will go over. With live power on all wheels they find traction on snow or ice where any conventional drive vehicle on the market, regardless of size or price, would spin its wheels.

Distributing the power of the sturdy Ford V-8 motor to all the wheels enables these trucks, passenger and commercial cars to perform feats of transportation that are almost unbelievable. For service in road building, maintenance and snow removal, for work in pits and mines, for logging, lumbering and forestry patrol, for desert and cross-country travel, on ranches and plantations, for utility service on and off the highway, they are supreme.

You'll be amazed at how little these vehicles cost. Even more surprised at their low upkeep and operating expense. A big new 16-page Illustrated News, showing Marmon-Herrington *All-Wheel-Drives* in action in all parts of the world is just off the press. It's yours for the asking. Write for it. Cable Address MARTON, Indianapolis, Indiana, U. S. A.

MARMON-HERRINGTON COMPANY, INC.
INDIANAPOLIS, INDIANA, U.S.A.

lubricate each track roller bearing, it is claimed. The pressure pump delivers 14¼ lb. of lubricant per minute for filling crankcases, transmissions and final drives. A 40-ft. air hose is furnished with each set-up with quick, detachable flex-tip valves for inflating tires, blowing dirt off motors, etc. A complete line of lubrication adapters are offered as optional equipment.

▼

New Self-Adjusting Expansion Joint

A new self-adjusting expansion joint was placed on the market during the past year by the Servicised Products Corporation, Chicago, Ill. This self-adjusting expansion joint can be prepared with the use of any of the commonly used resilient fillers. The resilient filler is grooved so as to receive a plastic asphalt rib. The ribs are sealed in the groove of the filler with hot asphalt during manufacturing process. This forms a perfect bond between the rib and filler, it is claimed, that is impossible to break without deforming the entire assembled joint. The completed joint is punched or notched so as to use any desired type load transmission device. These self-adjusting joints when installed form a groove on the side of the concrete slab to the contour of the rib joint, consequently the groove in the concrete is filled with a plastic asphalt filler. Upon expansion cycle of the slab the resilient filler is compressed within itself and the asphalt rib likewise is compressed against the concrete slab giving adhesion which remains constant even after the contraction cycle, according to the manufacturer's claims. The contraction cycle permits expansion of the resilient filler to its approximate original position. Laboratory tests reveal, it is claimed, that after a series of compression and recovery tests a permanent waterproof seal is maintained with no breakage of the bond between the ribs and the concrete slab. Self-adjusting joints are fabricated complete at the factory and are ready for instant installation on the job. They are punched or notched so as to receive any type of load transmission unit or dowel bars. The installation is made in the customary fashion by using the usual backing plates. A suitable internal vibration should be used for compacting concrete along the sides of the joint.

FINANCING
PUBLIC IMPROVEMENTS

The Pennsylvania Turnpike, now nearing completion, is an outstanding example of a self-liquidating public improvement financed through the issuance of Public Revenue Bonds. The past decade has witnessed a remarkable development in this type of financing. With the need for public improvements constantly increasing in the face of rapidly mounting public debt, we believe that the "pay-as-you-go" basis, which does not add to the general tax burden, is the most feasible and equitable ever devised.

We are especially equipped to originate and handle the financing of all types of self-liquidating projects.

B. J. VAN INGEN & CO. INC.

MUNICIPAL BONDS

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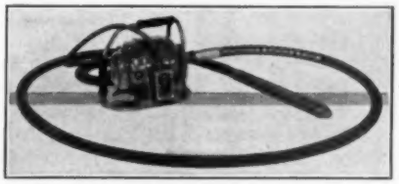
▼

New Light Weight Vibrator

A new light concrete vibrator announced by the White Manufacturing Co., Elkhart, Ind., has a 1½ hp. electric motor weighing only 29 lb. The unit is composed of standard parts, armature coils, etc., and can be serviced anywhere. This motor, with splashproof aluminum frame, is universal type and runs on either AC of any phase or DC current, 110 volts. It is mounted on aluminum base with two wooden handles. Usual speed of vibration under load is 6,300 per minute. Flexible drive is direct connected and can be supplied in any multiple of 7 ft. or 12 ft. interchangeable lengths. Vibrators are also interchangeable and either 1⅝ in. or 2⅜ in. diameter heads are available for this outfit. Motor, 7 ft. drive and 1⅝ in. vibrator weigh only 50 lb.



New Light Weight Vibrator

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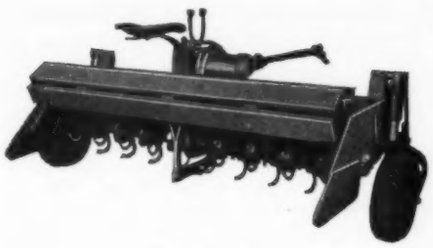
New Machine for Road Mix

A new machine for mixed-in-place road construction was announced by Ariens Co., Brillion, Wis. The machine, a development from the company's small power operated ground tillers, has a welded steel frame of one-piece construction, and is equipped with low pressure tractor tires. The machine has a removable draw bar easily adjusted to fit various tractors, removable seat, if tractor controls are used, and a power take-off shaft to fit any tractor take-off. Equipped with a hydraulic pump, hydraulic valve and reservoir, it also has a depth adjustment to meet conditions. The tines are easily replaced; the only tool required being a hammer. The spring and clamp assemblies also are easily removable from the hexagonal shaft. The tail piece is adjustable for work on road shoulders, etc. The breaker board, made of



The Aggmixer

wood, can be folded up. The machine has a simple sturdy drive, entirely enclosed. The machine has Timken and ball bearings throughout. When not in use a ram lock is provided to hold the machine.

▼

Welded Clamshell Buckets

Welded, heat-treated construction has now been employed for the entire range of contractors' buckets from the small ⅜ cu. yd. size up of the Wellman Engineering Co., Cleveland, O. This construction

Power Arm Type Bucket

is coupled with alloy shafts and pins, hardened bushings and hard-faced cutting lips. The illustration shows one of the power arm types having all-welded power arms and hinges. Contractors' buckets of this new construction will be on display at the Road Show.

▼

New Road Sweeper

A new axle driven road sweeper, which will sweep either to the right or to the left, the change being made by one man in a few seconds, was announced by W. E. Grace Manufacturing Co., Dallas, Tex. The overall width of the brush is 8 ft. with actual fibre width of 7 ft. 2 in. and diameter of 33 in. Hickory, bamboo, or wire brushes may be furnished. With the brush at right angles, the overall width of the machine is less than 8 ft. Three sweeping speeds are provided by a transmission with gears running in oil. All bearings are of the anti-friction type, with dust seals. Both rear wheels drive, providing ample traction, even though the machine is comparatively light in weight. The sweeper has three wheels, all tires being 6.00-16. This sweeper will be on display at booth T 15 at the Chicago Road Show.

New Road Sweeper

New Excavator, Self Propelled Scraper, Mixer

New models and improvements in the design and construction of many other units mark 1939 as an outstanding year of achievement for Koehring Co., Milwaukee, Wis. One of the many new models is the completely newly designed 604 Excavator, using new methods of construction. More high strength steels are used, replacing heavy casting, which provide strength and less weight. The turntable and side frames are welded integral, of slight weight, high strength steel plate and members. Gear cases, as well as the crawler frames, are welded steel plate. Forced flood lubrication, more anti-friction bearings, are wear

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the new **WARCO**

MODELS 101 and 105

- **Single Member Frames**
- **Engine Over Transmission**
- **90° Bank Cutting Angle**
- **Full Revolving Circle**
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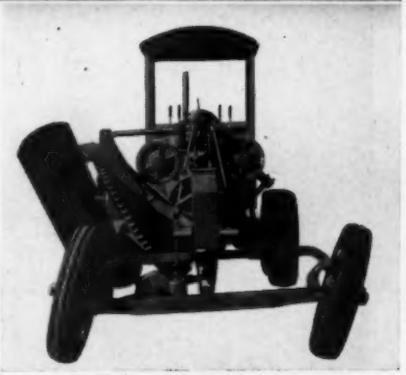

STABILITY - VISIBILITY - DEPENDABILITY

WARCO W.A. RIDDELL CORPORATION BUCYRUS - - OHIO

reducing features. Operation has been made more convenient because of an instrument panel combined with a group of levers located within easy reach of the operator without leaving his seat. The Koehring Trail-Dump Tractor was redesigned to provide greater operating comfort and protection. Diesel power was made available, providing higher speeds and more power. A new Dumptor model, with Diesel power, bigger capacity and higher travel speed, was added to the Koehring line of hauling equipment. Koehring Mud-Jack models were redesigned with streamlined appearance. An improved mud valve was installed, affording better mud passage with less clogging of the mud pump. Outstanding feature of the new model 3½-S Kwik-Mix nontilting mixer, is the absence of a drum ring gear, drum drive pinion and countershaft. The drum is driven by the rubber drum rollers, reducing noise vibration and excessive maintenance cost. The mixer is easily handled by one man, has a low shoveling height, wide charging hopper, fast discharge and weighs only 980 lbs.

▼

New 1½ Cu. Yd. Excavator

Its new 1½ cu. yd. excavator will be displayed by The Osgood Co., Marion, O., at the 1940 Road Show. This Model 800 is a rugged, powerful machine with many outstanding improvements. It is a medium weight machine with greater flexibility. Special attention has been given to streamlining and simplification. Much unnecessary wear and vibration have been removed through elimination of moving parts and straight-line flow of power. The machine is powered with either gas, oil or diesel engine. The silent chain drive is fully enclosed, running in oil. The reversing shaft mounting, instead of being a part of the side frame, is a separate unit, insuring greater strength. The countershaft has been eliminated, reducing the number of parts to wear and replace. Power takeoff clutch is mounted on the engine shaft. The horizontal gears on deck are recessed and enclosed, keeping out all dirt and foreign matter, reducing wear. The travel gears in the truck are fully enclosed and running in oil. Twin-disc type clutches are used for swing and retract motions. Another notable advancement is the air control. The machine is controlled throughout with air (except hoisting brakes, which are controlled through automotive type foot pedals).

Osgood Model 800 1½ *Yd. Shovel*

New Tamping Rollers and Rippers

Rippers and tamping rollers were recently placed on the market by Bucyrus-Erie Co., South Milwaukee, Wis. The new tamping rollers are offered in single, double, or triple drum models, with 72, 96, or 112 ft. per drum available in each model. All rollers have rear pull connections for working in trains, and all drums are provided with openings for ballast. Double and triple drum models have oscillating drums which permit the rollers to adapt themselves to uneven ground surfaces. The tamping feet are renewable; when they become worn. The new type rippers are of two types, the rotary type and the heavy duty cable-operated type. Outstanding feature of the rotary type ripper is a rotating head, which swings the ripping standards up and back and around to ripping position again quickly. This new equipment will be on exhibit at the Road Show.

New Tamping Rollers and Rippers

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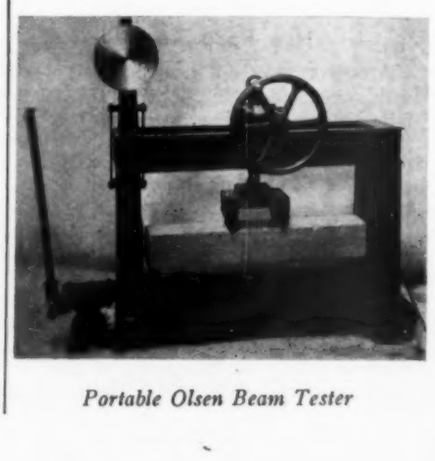
New Concrete Beam Tester

The Tinius Olsen Testing Machine Co., 500 N. 12th St., Philadelphia, Pa., announces a new machine for making flexural strength determinations on concrete. The



Portable Olsen Beam Tester

SAUERMAN LONG RANGE MACHINES

DIG, HAUL & DUMP FOR A FEW CENTS PER YARD

AMAZING EFFICIENCY—The Sauerman Power Scraper is the most popular machine for gravel excavation and general dirtmoving. The above picture shows why. Note the simplicity of the operation. One man does everything. Fifty cents an hour covers the fuel cost. The streamlined Crescent bucket digs a heaping load quickly in any class of material and hauls the load at high speed with a minimum of friction.

Use a Sauerman machine to reduce your equipment cost and operating expense on such work as the following:

—making long cuts and fills
—canal and levee construction
—cleaning reservoirs
—digging gravel from rivers, hills and pits
—stockpiling and reclaiming gravel, coal, ore, etc.
—and other long haul work.

A Sauerman machine has a great advantage over other types of equipment on work such as listed above because it is able to reach any distance up to 1,500 ft. and dig, haul and place the materials in one operation. For a complete explanation of the savings you can make by using Sauerman machines, write for our 84-page catalog.

See us at the Road Show

SAUERMAN BROS., Inc.

488 S. Clinton St., Chicago

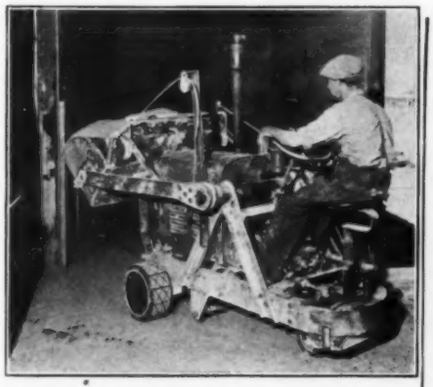
latest method of testing a simple beam is by the third-point loading method, where accurate control is desirable in hand-mixed concrete. This equipment meets the A.S.T. M. C 78-38 specifications for such a test, as well as the standard specifications of the A.A.S.H.O.

The third-point loading method as used in the Olsen equipment employs bearing blocks which insure proper application of load, without eccentricity, in a vertical direction. The upper dual bearing blocks are adjustable to any position along the frame and can be properly clamped on the reference marks for various sizes of beam spans. When the load is applied to the specimen, it is weighed by means of a lever in conjunction with a dial indicator indicating the strength to a maximum of 10,000 lb. on the upper bearing blocks. The hand on the dial will remain at the maximum test load after the sample breaks. A dash-pot is incorporated into the design to properly absorb the recoil of the specimen at break.

▼

Bulk Cement Unloader

A new machine was brought out last year by the Butler Bin Co., Waukesha, Wis., for unloading bulk cement from boxcars. The outfit consists of a midget sized tractor, with power operated scoop on the front, small enough to operate inside of a boxcar. The machine is powered by a 4-cylinder gasoline engine or electric motor (where electric power is available). The



Butler "Cement Hog."

operator controls the horizontal movement of the machine by a foot pedal on a reversible clutch. The bucket or scoop is mounted on two arms, raised or lowered by means of an hydraulic jack and dumped by tripping a latch. Power for the jack is furnished by a pump operating from the engine or motor with a valve for controlling the raising or lowering of the bucket.

▼

New Dodge Trucks

New 1940 Dodge trucks in 1½ ton and 2 ton capacities have increased horsepower, torque and gross weight ratings. This increased engine power and larger load-carrying capacity are available, it is claimed, without increase in fuel consumption, due to new design giving greater engine efficiency. Both new models have

New Dredge Truck

new truck type hypoid rear axles, giving greater gear tooth contact. Improved clutches, heavier construction in many front end details such as steering knuckle pivots, and new sealed-beam headlights have been incorporated in both models. One and one-half-ton models have 4-speed transmissions and are available in four wheelbases. An entirely new Dodge-built cab over engine with full width driver's seat and gear-shift lever in normal position is insulated against engine heat. The new 2-ton series with 99 hp. engine and gross weight rating of 15,000 lb. is available in five wheelbases. Heavy duty hauling requirements are met by the Dodge 3-ton line, with either gasoline or diesel power. Dodge trucks from 1½-ton through 3-ton sizes are available in dual-purpose models with 2-speed axles, a gear ratio for heavy pulling and another for speed and economy when light.

▼

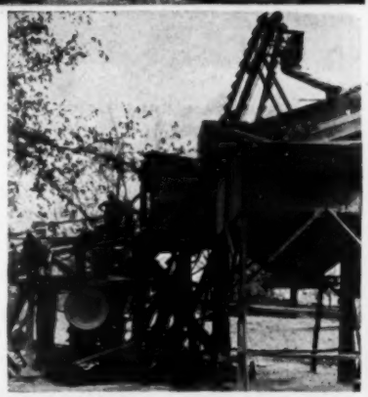
New Heavy Duty Hauling Unit

A new heavy duty hauling unit, the Dumpster Model 400LF, is now in production at the plant of Dempster Bros., Knoxville, Tenn. The construction of the 400LF Dempster-Dumpster is such that repairs are practically a thing of the past, according to the claim of the manufacturers. The unit is electrically welded throughout. The manufacturers claim for

The 1940 Dempster-Dumpster

it greatly reduced hauling costs over the conventional type of dump truck and that one Dumpster with 5 to 10 detachable drop-bottom buckets will increase the capacity of the truck on hand loading opera-

150 tons per hour are produced by this Universal Gravel Plant in Nevada, in use 5 years. Right: 30-Q, one of 50 types of Universal Quarry Plants, economizes for Illinois operator.



PROOF!

There's proof aplenty, if you want it, of the year-after-year economy, efficiency and high capacity of Universal Rock and Gravel Crushers and Pulverizers and Stationary and Portable Plants; proof that Universal's bearings and other design and construction features cut crushing costs by eliminating shut-downs and replacements, and by providing consistently high output at lowest cost per yard of finished product. Write for new catalog and *proof*.

See important new developments by Universal at Booth K-2-A, Road Show, Chicago

UNIVERSAL CRUSHER COMPANY
631 C Ave. West Cedar Rapids, Iowa

UNIVERSAL

THE NEW D-K SPREADER AND FINISHER

Can now be furnished as a self-propelled unit

Spreads automatically any type mix, hot or cold, any thickness. Levels without forms. Lays to give variable

widths from 6 to 10 feet. Capacity from 1,000 to 1,200 tons a day. Trouble-free, fast, dependable and economical. A high-production, profit-making unit eliminating need for manual labor in finishing.

MULTIPLE BLADE ROAD MAINTAINER

Works surface four times each trip. One man operation, hand or power control. Powered by any tractor. Forty feet of blades. For gravel, sand, clay, earth or stone. Will do the work formerly requiring several different pieces of equipment.

Write for Literature Giving Full Details.

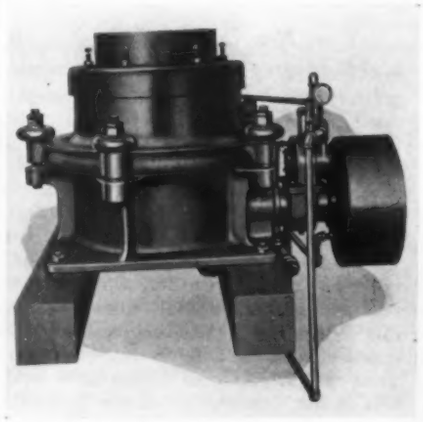
THE SHUNK MFG. COMPANY

BUCYRUS, OHIO

tions. Half of the load distribution is ahead of the rear axel, which the manufacturer claims makes unnecessary any counterweight or auxiliary springs.

New Crusher

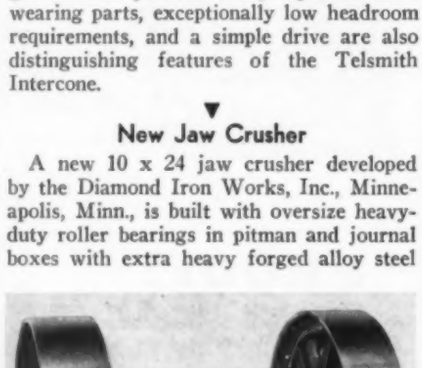
A crusher for secondary and fine crushing developed by the Smith Engineering Works, Milwaukee, Wis., is said to have several design features which enable it to produce ½ to ¾ in. rock at a decidedly lower cost per ton. This crusher, which is known as the Telsmith Intercone, is a high-speed crusher with a conical head which gyrates horizontally within an outwardly flaring curved concave bowl. Material crushed in the upper zone automatically spreads over a greater area as it moves downwardly, between crushing strokes, through the lower crushing zone to the discharge opening. This design, says the manufacturer, together with strong steel structure, lead-bronze eccentric sleeves, manganese steel wearing surfaces, force feed lubrication and positive protection against tramp iron, are all "low-cost operation features." Simple, fast adjustment, together with quick and easy replacement of wearing parts, exceptionally low headroom requirements, and a simple drive are also distinguishing features of the Telsmith Intercone.



Telsmith Intercone.

New Jaw Crusher

A new 10 x 24 jaw crusher developed by the Diamond Iron Works, Inc., Minneapolis, Minn., is built with oversize heavy-duty roller bearings in pitman and journal boxes with extra heavy forged alloy steel heat treated eccentric shaft. Extra long pitman allows the use of long manganese jaw plates with graduated contour that gives positive breaker grip and rapid passage of reduced product. The ribbing and contour of these jaw plates are designed to crush to desired size with minimum under and oversize materials. All crushing and abrasive resistant parts are made of the highest grade cast manganese steel obtainable and mainframe, pitman and all stress resistant parts are of electric steel casting annealed. The cast steel mainframe and pitman are heavily ribbed with cast-in heavy rugged bearing seats. The unit is equipped with safety toggle and fast action reversing ratchet jaw adjustment.



New Diamond Crusher.

New 3-Yard Truck Mixer

A new 3-yd. truck mixer and agitator brought out by the T. L. Smith Co., Milwaukee, Wis., is claimed to have many new features. The large feed chute takes the place of the conventional loading hatch.

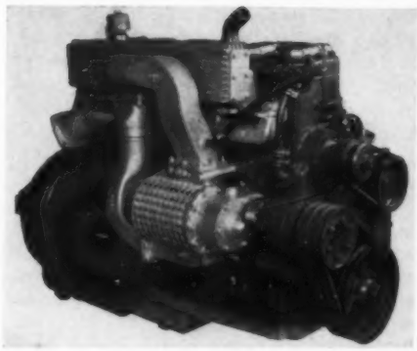
Smith-Mobile Truck Mixer.

During the charging operation, the drum revolves, so that shrinking and mixing start as soon as the materials enter the drum. An unusually high discharge, claimed for the Smith-Mobile, permits discharge into high forms without the aid of a rear-end hoist. The flow of concrete can be controlled for either fast or slow discharge, without danger of segregation. The mixer can be seen at the Road Show in Booth T-13.

Supercharged Diesel Engine

A new, light-weight 125-hp supercharged diesel engine, Model AAS-600 has been announced by the Cummins Engine Co., Columbus, Ohio. The new supercharged AAS-600 operates on the four-cycle principle, has the same 4″ bore and 5″ stroke as the standard Model A units, and develops maximum horsepower at 2200 rpms. This model is a refinement of the popular standard Model H engine with 4⅞″ bore and 6″ stroke. With a few mechanical changes and the supercharging unit, this diesel's 150 hp. is boosted to 200 hp. at the same engine speed of 1800 rpms. There is no appreciable increase in weight or dimensions over standard models.

The supercharged Cummins Diesels weigh 10 pounds per horsepower, including the weight of standard equipment, such as the fuel pump, electric starters, etc. The fundamental principle of supercharging the Cummins Diesel is to put more air into each cylinder which makes possible the burning of more fuel or a more efficient burning of a given fuel charge on each



New Cummins Engine

power stroke. The supercharging unit itself is only a small compressor or blower which creates a pressure behind the air entering the diesel through the intake manifold. The supercharged Cummins Diesel has approximately 7 to 8 lbs. of air pressure in each cylinder at the start of the compression stroke. This, as well as the other new diesel engines of the Cummins Engine Co., will be on exhibition at the Road Show.

▼

New 3/8-Yard Shovel

A newly designed 3/8-yd. excavator was brought out by the Universal Power Shovel Corporation, Milwaukee, Wis. This is said to be unusually compact and lightweight, yet engineered to handle tough ex-

Unit 412 3/8-yd. Excavator.

cavating or material handling jobs. Simplicity of design, all-welded construction and fewer working parts are features claimed for this new machine. All gears, shafting, bearings and other rotating parts move in a bath of oil permanently sealed against metal cutting abrasives. This excavator will be on exhibit at Booth G-1 at the Road Show.

▼

New Model Maintainers

The new Master Workman maintainer, Model MA, manufactured by the York Modern Corp., Unadilla, N. Y., is designed to give the operator every advantage in doing an excellent job on all types of roads and is built to give years of satisfactory service, according to the manufacturer. As in all Workman machines, three working units, scarifier, blade and rake, are combined in one machine. The scarifier is adjustable to meet all requirements because of independent controls which enables the operator to apply pressure on either side. The blade consists of a heavily reinforced moldboard with steel cutting edge. It has ample capacity to meet a wide range of grading and maintenance requirements. The rake is designed to pick up and spread all material displaced by the blade, and screen out the oversize stones. This unit, being made entirely of carbon and spring steels, is strong enough to handle capacity loads, it is claimed, yet flexible enough to conform to the contour of the road. Other features of the machine include a sturdy frame, electrically welded into a solid unit; machine cut, heat treated gears and machine cut, case-hardened worms fitted with end thrust bear-

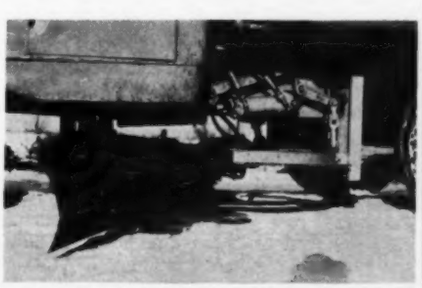
The York Modern Road Maintainer

ings operating in oil-filled gear cases; disc wheels equipped with tapered roller bearings and heavy duty ribbed tread pneumatic tires; pressure lubrication on all bearings and moving parts.

▼

New Underbody Truck Grader

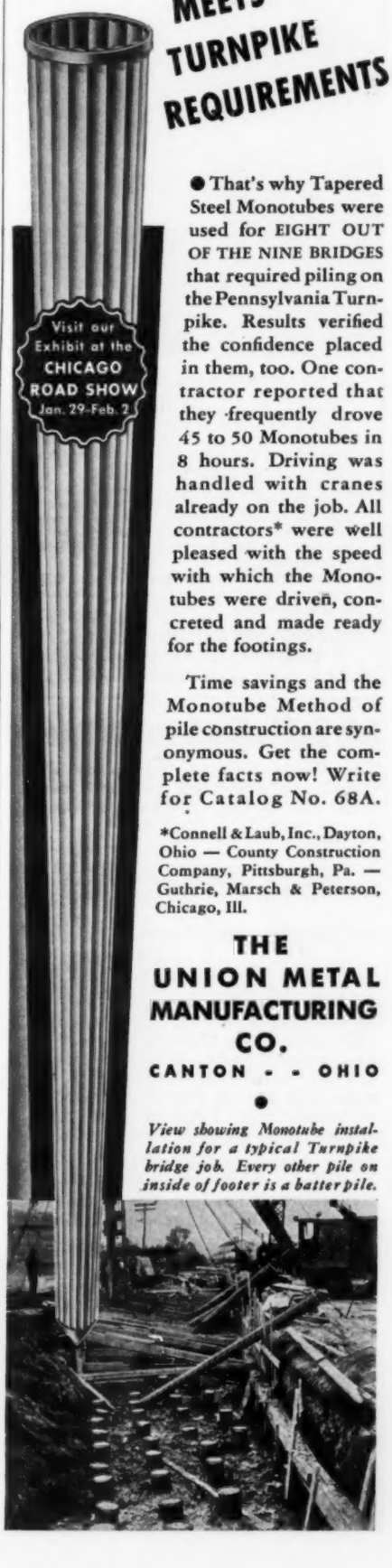
A new underbody truck grader stated to embody many new features was brought out by the Willett Manufacturing Co., Grand Rapids, Mich. These features include power reversing, power tilting, power rotating, equipped with curved moldboard and curved blade, which can be used either in a rigid or flexible manner by merely opening or closing a cutoff valve on the Willett cushion device which cushions the contact of the blade with the road surface. This new model is hydraulically powered by power take-off off the truck transmission, with controls mounted in the truck cab. All adjustments both of the machine and of the slope of the blade are hydraulically controlled from the driver's



New Truck Grader

Monotube Method

MEETS TURNPIKE REQUIREMENTS



● That's why Tapered Steel Monotubes were used for EIGHT OUT OF THE NINE BRIDGES that required piling on the Pennsylvania Turnpike. Results verified the confidence placed in them, too. One contractor reported that they frequently drove 45 to 50 Monotubes in 8 hours. Driving was handled with cranes already on the job. All contractors* were well pleased with the speed with which the Monotubes were driven, concreted and made ready for the footings.

Time savings and the Monotube Method of pile construction are synonymous. Get the complete facts now! Write for Catalog No. 68A.

*Connell & Laub, Inc., Dayton, Ohio — County Construction Company, Pittsburgh, Pa. — Guthrie, Marsch & Peterson, Chicago, Ill.

THE UNION METAL MANUFACTURING CO.

CANTON - - OHIO

●

View showing Monotube installation for a typical Turnpike bridge job. Every other pile on inside of footer is a batter pile.

HAUCK

Oil Burning
WATER HEATERS

for heating large quantities of water in cold weather for concrete mixers and central mixing plants. Double Conical Heating Coil and Water Jacketed Shell heat mixing water from 40°F. to any temperature rise up to 180°F., efficiently, quickly and economically.

ALSO

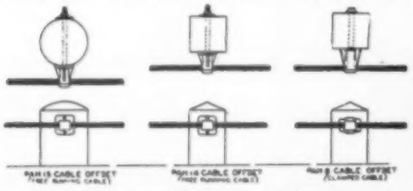
CONCRETE HEATERS heat aggregate in mixer, assuring uniform batch discharged at 60° to 90°F. even in zero weather. Holds heat 96 hours for ample setting time.

Other Hauck specialties include Oil Burning Salamanders, Super Heated Steam Thawing Outfits, etc.

HAUCK MANUFACTURING COMPANY
119-129 10th St., Brooklyn, N. Y.

M.I.F. Cable Offsets

The Cable Offsets (patented) illustrated are preferred alternate standards in various States because of



rugged construction, attractive appearance, ease of installation and reasonable price. Two types at left for round and square posts, otherwise similar, are used with free-running cable, Compensating Spring End Anchorage construction, etc. Type at right clamps cable rigidly at each post.

Other types available for converting hook bolt construction to offset construction; also saddle type End and Intermediate Anchorage Post Offsets.

Sample recommended Cable Offset will be sent free to responsible Highway Official or Contractor on receipt of data as to post dimensions, cable rating, etc.

Other M.I.F. Specialties include: Compensating Spring Anchorages, Union Type Cable Splices, Wedge Type Cable End Sets, Offset Pipe Railings, etc.

MALLEABLE IRON FITTINGS CO.
Pole Hardware Dept.
Branford, Conn.

seat in the truck cab; that is, the curved moldboard and blade can be used in any slope from the complete vertical to the horizontal as may be required for easy cutting or merely floating operations. Made in 10 ft., 12 ft., 14 ft. lengths. This will be exhibited in Space M-14 at the Road Show.

New 34E Paver

A new 34E dual drum paver was brought out late in the year by the Ransome Concrete Machinery Co., Dunellen, N. J. The machine has a diesel engine as its power unit. The paver is designed with a minimum height to meet average road conditions as regards overhead passes. This mixer is naturally provided with the well-known Ransome scientifically designed

New 34E Paver

mixing blades and drums. The discharge is provided with the newest thing in the form of a two-piece discharge chute. The boom is longer than was formerly made on their 27E "dual drum" paver. The boom swing, water valves, transfer chute and discharge chute are hydraulically controlled with automatic features.

Hydraulic Power Pump Unit

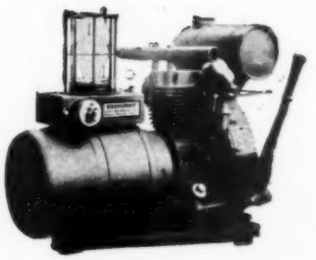
A new hydraulic power pump, the Monarch Hy-Rocket, is announced by the Monarch Road Machinery Co., Grand Rapids, Mich. It can be used on new or existing truck or tractor mounted equip-

Monarch Hy-Rocket Hydraulic Power Pump

ment to control heavy, hard-to-handle road machinery. The standard control valve is designed for single acting or twin cylinders only and for multiple cylinder or for double acting cylinders additional valves are necessary. The Hy-Rocket is a continuous-running, fan-belt powered gear pump. It provides switch-flip control of snow plows, truck scrapers and similar equipment.

Lighting Units

Two new models have been added to the Katolight line by the Kato Engineering Co., 103 Elm St., Mankato, Minn. These, the 19A and 23A, are combination AC/DC models generating 110 volts, 60-cycle AC or 6 volts DC which can be used for bat-



Model JR55 Katolight Plant

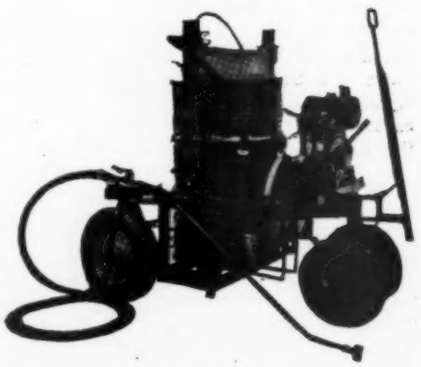
tery charging. Come complete with push-button starting, very compact, light weight, portable. Permits charging 6 and 12 volt auto, truck or tractor batteries. Just clip on connecting wires; not necessary to remove battery from machine. The illustration shows the improved Model JR55. This is a completely self-contained unit, driven with a four-cycle air-cooled engine. Complete with hand lever starter, high tension magneto, pilot lamp which lights area around plant, two standard convenient receptacles, convenient carrying handles. It weighs 105 lb.

New Saw-Tooth Grader Blade

A new type of blade, called the Shunk saw-tooth ice, snow, sleet and maintenance blade, was put on the market by the Shunk Manufacturing Co., Bucyrus, O. This saw-tooth blade is a special grader blade with sharpened edges and with a series of teeth cut angling in the lower edge. The blade is detachable, replaceable, serrated, notched or saw-tooth, for the removal of traffic compacted snow, ice or sleet from highways and pavements. The blade is adaptable to all types of road maintenance and snow removable equipment such as all makes of motor graders, snowplows, bulldozers, undertruck maintainers, road drags, etc. The attaching holes are punched to fit any and all types of motor graders, snowplows or drags.

New Asphalt Emulsion Sprayer

An asphalt emulsion sprayer recently brought out by the Tarrant Manufacturing Co., Saratoga Springs, N. Y., not only applies this material direct from the shipping drum but will accommodate a drum having the large opening in either the side or the end. The drum may be placed in the ma-



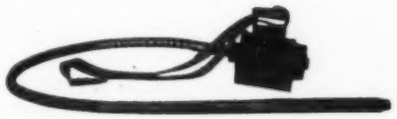
New HV Asphalt Emulsion Sprayer

chine in either a horizontal or vertical position and the tube for insertion into the drum will fit into either a 1½ in. or 2 in. bung, both of which are standard. These machines maintain spraying pressure automatically and no asphalt pump is employed. They have capacity to supply two spray hoses simultaneously and connections for two hoses are furnished. The screens provided are unusually large and are arranged for quick cleaning. A pressure flushing attachment for the spray lines is an extremely practical item of regular equipment. The mounting of these units on four roller bearing, pneumatic tired wheels greatly facilitates their easy manipulation on the job.

▼

New Concrete Vibrator

A new high-speed, electric motor driven internal concrete vibrator was placed on the market late in the year by Syntron Co., 384 Lexington Ave., Homer City, Pa. As a driving medium, it employs a 110 volt universal motor weighing approximately 25 lbs., that is fitted with a thick, soft rubber pad and a shoulder strap so that it can be carried around by the operator as a portable piece of equipment. The vibrating head is of 1⅝ in. diameter, 18 in. long, and vibrates at a speed of from 9,000 to 10,000 R.P.M. The flexible lengths of shaft in either 6 ft. lengths or 12 ft. lengths, make up the rest of the equipment, together with a 40 ft. long electric cord fitted with ground wire.



Syntron High-Speed Vibrator.

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Spray Gun and a Regulator

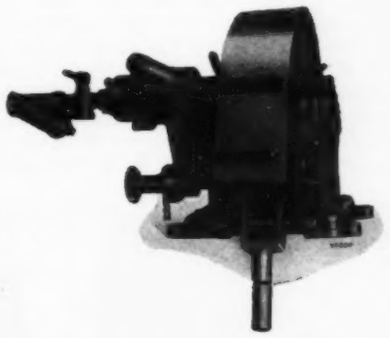
Of the many new items introduced by the Alexander Milburn Co., Baltimore, in 1939, there are two which find application in the road construction industry, an oil spray gun and a ball seat regulator. The Milburn Type KSC oil spray gun is designed to remove caked grease and dirt from engines, but is equally efficient, it is claimed, as a sprayer of springs, shackles and other automotive parts. An unusually long nozzle permits coverage in ordinarily inaccessible places. It has a die cast body and is easily held and operated with one hand. The Type F regulator, with ball valve, offers the latest development in simplified regulators. It has a unitary valve assembly, which is dirt-proof, nonscoring and practically frictionless, according to the manufacturer. Other features include seating with, instead of against, the pressure; a loose replaceable diaphragm, and removable and interchangeable inlets, which are adaptable to any tank or line connection for any type of gas. This regulator is made of high grade forgings with a tensile strength of 50,000 lb. per sq. in.

Milburn Oil Spray Gun

▼

New Drill Steel Cutter

A new combination drill steel cutter and shank grinder brought out late last fall by Ingersoll-Rand Co., 11 Broadway, New York City, is designed to handle solid or hollow steel up to and including 1¼-in. hexagon, round or quarter octagon. Its quick acting, self-locking vice holds the steel rigidly on both sides of the cut. The unit can be readily changed from a cut-off machine into a shank grinder by removing the cut-off wheel and substituting a grinding wheel. As a grinder it can be used for squaring up striking faces of the shanks of drill steel, moil points, chisels and the striking end of rock drill pistons.



Combination Drill Steel Cutter and Shank Grinder.

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A New Scarifier

The new General Workman scarifier, Model GA, manufactured by the York Modern Corp., Unadilla, N. Y., incorporates new features to give it an increased range of usefulness. The scarifier is effective in digging up hard surfaces and will not gouge into soft spots or ride over the tough ones, it is claimed. The moldboard is of ample capacity and is securely mounted on a machined circle. The circle is supported by the drawbar at four points by means of four adjustable guide shoes. The rake is fully reversible and may be quickly shifted to discharge at either the right or left, or it may be set at right angles to the frame when not in use. Latest improved type hydraulic controls enable the operator to make all adjustments of the three working units with ease and accuracy, according to the manufacturers. Power for the hydraulic circuit is supplied by an air-cooled, single-cylinder engine with a gear type pump mounted by means of a spur gear assembly. The control valves are self-centering with built-in relief valve. The machine is adjustable to many kinds of road work such as cutting ditches, sloping banks, widening

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What Wellman did for the Steel Industry, they now do for the Construction Industry!

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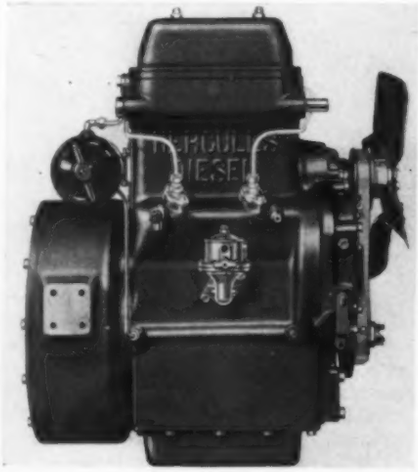
ST. LOUIS, MO.

and reshaping roads, scarifying and smoothing gravel or dirt roads, and mixing and spreading many kinds of materials on new construction.

▼

New Two-Cylinder Diesel Engine

Hercules Motors Corporation of Canton, Ohio, following out its policy of making available the economies of diesel operation, announces three new models of DIX series two-cylinder, high-speed, heavy-duty diesel engines and power units. The manufacturer states that this new two-cylinder diesel incorporates several interesting new features and was designed for extreme simplicity, economy and reliability. The engine has the same bore and stroke and combustion system as the well-known Hercules DOO and DJX engines. Most of the vital parts of the new two-cylinder model are identical with the corresponding parts used in the four-cylinder DOO and the six-cylinder DJX engines, assuring the buyer the advantages of actual field experience of many millions of operating hours. Model DIXB develops 24 hp. at 1,800 r.p.m. and has a maximum torque of 73 at 1,300 r.p.m. Model DIXC develops 27 hp. at 1,800 r.p.m. and has a maximum torque of 82 at 1,300 r.p.m. Model DIXD develops 27 hp. at 1,600 r.p.m. and has a maximum torque of 92 at 1,300 r.p.m. The engine is primarily built for hand starting. A large flywheel and an effective decompression device built into the cylinder head facilitates starting. The fuel pump and governor were incorporated in the design of the cylinder block itself. The easily replaceable fuel plungers are driven by the engine camshaft. An entirely enclosed, but easily accessible governor is mounted on the camshaft gear. The flyball type governor is spring loaded and an outside control lever enables it to change the tension of the governor spring, thereby controlling the engine speed within a wide range.

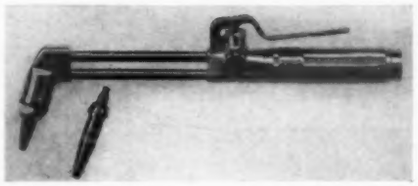


Hercules New Two-Cylinder Series DIX Diesel Motor

▼

Welding and Cutting Equipment

A number of improvements are featured in the new line of Prest-O-Weld welding and cutting apparatus, introduced by the Linde Air Products Co., 30 East 42nd St., New York City, after extensive field tests. This new equipment consists of a welding blowpipe, cutting blowpipe, and cutting attachment. All retain the detachable valve body construction, exclusive with Prest-O-Weld equipment, which permits quick changing from welding to cutting, and cutting to welding. The Oxweld (Type W-26) heavy-duty welding blowpipe, illustrated herewith, is for welding and heating ranges above those which can be handled by the ordinary blowpipes. It delivers a tremendous amount of heat to a localized area, and does this so quickly that metal-working and heat-treating can be accomplished at top speed.



Oxweld Blowpipe for Heavy-Duty Welding and Heating Operations.

▼

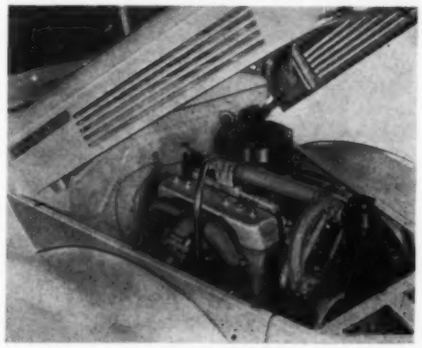
New Portable Mixing Plant

A new portable concrete mixing plant was developed and put on the market recently by the Erie Steel Construction Co., Erie, Pa. This new Strayer portable concrete mixing plant consists of loading, batching, mixing, power and other units all mounted on eight pneumatic tires, fully portable by truck tow. It is claimed by the manufacturers that exclusive of the cement labor, one man can batch, mix and discharge the concrete, working the various operations from his station on the rear platform. It finds application in the building of bridges, foundations, culverts, overpasses and in road and street construction. The bucket elevator is of the vertical, fully enclosed type with a capacity of 60 tons per hour when continuously fed. The bin has a heaped capacity of 20 cu. yd. The mixer has a capacity up to 30 yd. an hour. It is powered by a 32 hp. gas engine. It has a welded frame and the rear wheels are equipped hand brakes operated from the driver's seat.

Erie Portable Concrete Mixing Plant.

Diesel Replacement Engine

The complete Power Package diesel replacement engines for the 1940 Ford conventional and cab-over-engine truck chassis are in production, it is announced by officials of Hercules Motors Corporation, Canton, Ohio. These new diesel assemblies, built in accordance with the 1940



Hercules Diesel Replacement Engine.

specifications, can be installed as in previous models since all required changes have been made, and all necessary fittings are supplied with each unit shipped, the manufacturers state. A new installation manual covering the sequence of procedure is also ready, for both the conventional and cab-over-engine models.

▼

New Air Line Lubricator

A new air line lubricator announced last November by Ingersoll-Rand Co., 11 Broadway, New York City, will operate in any position. Designed primarily for rock drill lubrication it can be used

Oil-Ir Air Line Lubricator.

on many kinds of air operated tools. Body construction consists of heavy steel tubing and forgings. Adjustment of the oil feed can be made without taking the pressure off the chamber and without interrupting the work. The lubricator will not "siphon back" or leak when the air pressure is released. It can be filled in either the vertical or horizontal position.

▼

Pumps

During 1939 Marlow Pumps, Ridgewood, N. J., brought out the following: A 1½ in. self-priming centrifugal pump, A. G. C., rating 3M, powered with a 1 h.p. Briggs & Stratton engine. This is made in both cast iron and the aluminum types, weighing 79 and 61 lbs., respectively. Two in. and 3 in. light weight aluminum pumps, powered with the Model AA and ABS Wisconsin engines of the 4 cycle type. The 2 in. pump weighs 97 lb.; the 3 in. weighs 104 lbs. The 2 in. is rated at 8M and the 3 in. at 15M. All units are guaranteed to handle a suction lift of 25 ft. at sea level.

Improved Roller Bearings

While the basic principle of the Timken tapered roller bearing has remained unchanged since the bearing was introduced over 41 years ago, engineering development, however, has been continuous. Manufacturing methods and material also have undergone steady improvement. Thus the Timken roller bearing of today is a highly-refined mechanism, at once extremely accurate and possessed of tremendous strength and stamina, the manufacturer claims. One of the latest applications is in the truck wheels of crawler type tractors where the anti-friction efficiency and radial-thrust load capacity of Timken bearings result in improved performance and reduced maintenance, it is claimed. New seals keep out dirt and water and at the same time enable oil to be used for lubrication instead of grease, with a considerable saving in lubricating time. The Timken-Roller Bearing Company will exhibit at the 1940 Road Show.

▼

9-Ft. Tires for Tractor Scrapers

Tires weighing more than 2,600 lb. each and capable of carrying a load of more than 36,000 lb. apiece were placed in regular production by the Firestone Tire & Rubber Co., Akron, O. They stand more than 9 ft. in height and have a cross sec-

Tire 9 Ft. High

tion of close to 3 ft. They are used on earth moving equipment. The tube in one of these latest tires weighs 150 lb. and the protecting flap more than 50 lb. It has 34 plies of gum dipped fabric but surprisingly enough only requires 35 lb. of air. The four tires on each piece of earth moving equipment have a load capacity of 75 tons.

▼

New Rock Drill

A new drifter rock drill added to its Thor line by the Independent Pneumatic Tool Co., 600 W. Jackson Blvd., Chicago, Ill., is designed for heavy duty drifting in large tunnel work and in mining. It is stated of this drill that used with 1¼ in. and 1½ in. round lugged steels, its power and strong rotation give it remarkable drilling speed in the hardest formations. In addition, a constant blowing action keeps the hole clean and for final hole cleaning a manually operated valve is easily accessible for extra blowing power. One out-

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Quickly and Economically

Highway departments from coast to coast have tested and found the Butler Sand Distributor the most simple and effective sand and abrasive spreader ever built. Light in weight—the entire unit hangs from the end-gate of a truck like an outboard motor. Installed in just a few minutes with no special fittings required. Spreads sand, calcium chloride, cinders or other abrasives quickly and evenly at any speed or while truck is backing up. The Butler way is the quick, easy, economical way to end slippery roads. Write today for full particulars.

MODEL P
Driven by small gasoline engine. Operated by one man.

AUBURN METAL PRODUCTS COMPANY
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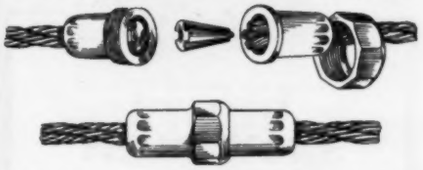
Safety for the Nation's Highways

Guard Cable Splice of Approved Design



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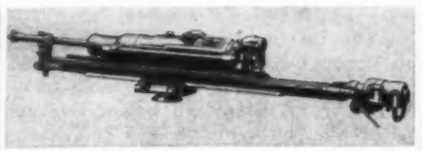

New Drifter Rock Drill

standing feature of the drifter is common to all Thor rock drills. This is the positive, short-travel valve which controls the air admitted to the tool. Another development recently announced for use with Thor drifters is the new Thor "power feed." This is powered by an independently balanced rotary air motor mounted rigidly on the rear end of the guide shell and power is transmitted through planetary gearing from the motor directly to the feed screw. Perfect alignment of the rotor with the screw is accomplished by a splined driving unit so that the shock on the feed screw is not transmitted to the motor mechanism, but is absorbed by the shell. Coil springs mounted at each end of the shell prevent shock when the drifter is in extreme forward or rear position.

▼

New Truck Line

The Marmon-Herrington Co., Indianapolis, Ind., announced for 1940 the conversion of all standard Ford trucks, passenger and commercial cars to all-wheel drive. These units, added to more than 30 heavy-duty all-wheel drive trucks and truck-tractors with load capacities up to 70,000 lb. make up what is said by the manufacturer to be the most complete line of vehicles with power and traction on all wheels on the market. Conversion of Fords to all-wheel drive, as accomplished by Marmon-Herrington, improves the tractive ability and effective power of the vehicles, enabling them to climb steeper grades, traverse deeper mud, sand or snow and to operate with greater speed and safety on slippery highways, according to officials of the company. These vehicles are used in the oil fields, for road building, snow removal, logging and other on and off the highway services, where, it is claimed, the advantages of all-wheel drive traction are most effective.

▼

2-Cycle Diesel Engines

Six different models of the 71 Series of General Motors 2-cycle diesel engines designed with the requirements of the road building, dirt moving and allied industries in mind will be exhibited at the Road Show. Featuring the display will be two 6-cylinder "packaged power" units, one equipped with a clutch for belt drive, the other a 90-kilowatt generator set with the engine, generator and control cabinet fully enclosed so they are protected from the weather. Rated at 90 hp. for continuous service, the engine powering each of the units is mounted on a structural steel base that holds the radiator, starting batteries and fuel tank. Other models will include a 3-cylinder, 83-hp. truck replacement engine and a specially developed 4-cylinder model for use in powering shovels, mine locomotives, draglines and other such equipment. It is rated at 110 hp. for in-

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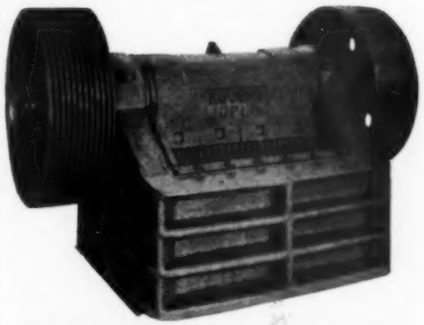

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termittent service. A single-cylinder generating set of 10 kilowatt capacity and a 3-cylinder "packaged power" unit for general applications complete the engine display.

▼

Hydraulic Dump Hoist

A new hydraulic hoist, Model GH-60, was reecntly announced by the Galion Allsteel Body Co., Galion, Ohio. It is a heavy duty hoist rated up to 25 tons. The cylinder has an inside diameter of 10 in. The piston is a heavy casting hand-fitted with steel piston rings. The inside wall of the cylinder is machined, then honed to permit as nearly perfect performance as practicable. The lift arms are rugged cast-

The Galion Hydraulic Hoist.

ings tied in with a huge crosshead which works in conjunction with the 3 in. piston rod. The same principle of equalizing lift links which characterize the Galion line, are used in the GH-60. A new heavy duty roller-bearing pump is standard equipment on this hoist. It is a faster operating pump than is customarily available with a hoist of this size, the manufacturers claim. Of particular interest and concern to dump truck operators is the low mounting height of 14 in. Oil pressures in the system are low and uniform.

▼

New Snow Plow Models

A new and improved snow plow was put on the market recently by the Wausau Iron Works, Wausau, Wis. This new model, TM4-90, is a V type truck plow with right-hand front frame mounted wing. The model has a cutting width of 9 ft. and the moldboard is 6 in. longer on the left-hand side than on the right. The reason for this is that 6 in. more clearance on the left-hand side for the tires because the right-hand wing amply protects the right-hand wheel and the present tendency is to keep the cutting width down as much as possible. The model TM-4 wing which is used in connection with this V is claimed to be extremely flexible since it can be placed in any position or laid back flat against the truck cab simply by operating the hydraulic valve within the cab. The wing has a positive down pressure which is stated to enable it to shear off the banks of snow to any desired height or to provide a unit for ditching.

▼

New Type 30 Excavators

A new line of Type 30 excavators, consisting of three new medium weight, high speed mobility machines, was announced by the General Excavator Co., Marion, O. The new line consists of ½, ⅝ and ¾ yd. machines, all fully convertible with any standard attachments. Among the many new improvements and new features of design claimed by the manufacturers are: favorable ratio of power to weight; unit cast steel alloy frame to keep shaft and gear in alignment; independent boom hoist enclosed, running in oil; swing bevel gears enclosed in cast steel gear case, oil lubricated bigger drums and sheaves give cable longer life; fast reversing (2 to 1) chain crowd for shovel permitting faster dipper filling. The Model 307 will be displayed at the Road Show.

▼

Aerial Mapping Developments

The Stratoplane Explorer, a special airplane and camera equipment for high altitude mapping, was developed by the Abrams Aerial Survey Corp., Lansing, Mich., last year. Aerial photographic surveying and mapping is coming into prominence and importance in highway work, and highway engineers will use more of this type of service as the years go on, it is claimed. The airplane and camera equipment developed is especially designed to do highway photographic surveying.

▼

Portable Alphalt Mixing Plant

Several new features are claimed for the Simplicity double shell asphalt drying and mixing plant developed and built in 1939 by the Simplicity Systems Co., Chattanooga, Tenn. It is claimed by the manufacturer that the double shell 30-ft. dryer, while affording a capacity of a dryer double the size, makes it possible to mount it for easy transportation. The tower assembly is mounted on hinged seamless tubular steel columns, which are placed on their footings and raised into position with a minimum of difficulty. Screen and storage bin are lifted into place by means of four Beebe hoists and kept there by four knees attached to the tubular columns. Mixing and weighing assembly follow, and all are bolted in simple manner to two sets of knees. Elevators on hinged bases are pulled into place, and the cyclone dust collector can be raised into position by the Beebe hoists on the tubular columns.

The whole plant is designed for compactness, occupies a minimum amount of space, and is separable into units of most convenient size, shape, and weight for shipment, it is claimed.

▼

Highway Mower

The 1940 Model of the Silver King Hi-Way Mower of the Fate-Root-Heath Co., Plymouth, Ohio, which will be on exhibit at the Road Show, has the following specifications: Power, 25 H.P.; 12 H.P. at the draw bar; speeds—low, 1 to 2.25 m.p.h.; second 3.35; third 5.5 m.p.h.; transportation, 25 m.p.h.; reverse 1.5 m.p.h. Weight of tractor and mower approximately 2,600 lbs. Width of tractor with cutter bar in action, 9 ft. The mower has one man control, flexible control of cutter bar, and automatic and hand controlled clutch.

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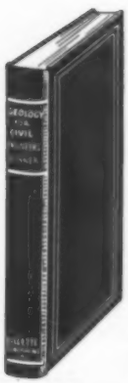

Rock and soils, and their characteristics, both physical and chemical, as well as their classifications and geographical distributions are discussed in such a way as to make this book particularly valuable for civil engineers and for engineering colleges. The chapters on material surveys, together with those on the petrographic microscope and its use constitute a real contribution to the fund of knowledge on engineering geology. This is the first time that the theories of general geology have been correlated by a competent engineer and geologist with the requirements of highway engineering. The book is written from the engineer's viewpoint for engineers. It puts into usable, understandable language the facts concerning rock formations and gravel deposits hardness or toughness values, how to recognize suitable or undesirable materials, and the source or origin of rock types. It is particularly useful to those engineers charged with the responsibility of materials selection for construction or maintenance work.

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